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FRANKLIN'S CONTRIBUTION TO MEDICINE

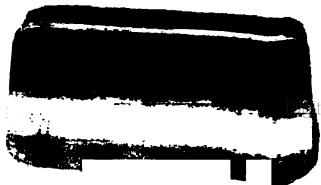
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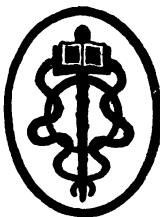


Franklin's Contribution to Medicine

Franklin's Contribution to Medicine

Being a Collection of Letters
Written by Benjamin Franklin
bearing on the Science and Art
of Medicine and exhibiting his
Social and Professional Inter-
course with various Physicians
of Europe and America

By Theodore Diller



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DEDICATION

To the Dear Memory of My Wife

253785

PREFACE

THE Pittsburgh Academy of Medicine, before whom this essay was read in abstract on November 27, 1907, passed a resolution at that time requesting me to publish it. And this I set about to do; but delays in the matter were many and prolonged with the result that more than four years have elapsed between the preparation of this essay and its publication.

Probably very few physicians have an adequate idea of the extent of Franklin's writings relating to their profession and of the soundness and the very substantial character of some of his contributions. Franklin must ever be accounted as one of the greatest benefactors, friends and patrons of the medical profession as well as a most substantial contributor to the science and art of medicine. Had this great man labored only in the field of medicine and done nothing else than is herein set forth, these things would entitle him to the lasting gratitude of his fellow men.

T. D.

*Pittsburgh, Pa.,
January, 1912.*

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Franklin's Contribution to Medicine



THE 200th anniversary of Benjamin Franklin's birth was celebrated last year with appropriate ceremonies in Boston and Philadelphia; and, in consequence, the life and works of this great man have become the subject of renewed interest and study.

Sainte-Beuve pronounced Franklin the most French of all Americans. Thomas Carlyle, beholding a portrait of Franklin, at an exhibition, remarked to a group of spectators, "There is the Father of all the Yankees."

The life and works of Franklin bearing upon Medicine and the Medical Profession are, it appears to me, well worthy of study and contemplation by the physician. Toutourat, in a small thesis published in Paris, in 1900, has previously undertaken this task which I am now attempting. I know of no other essay on Franklin but that of Toutourat, which has for its object the study of Franklin from the standpoint of the medical man. Several new works have been published since the date of Toutourat's essay, containing valuable letters and information concerning Franklin. The time, therefore, appears to me appropriate for another attempt to study Franklin from the medical man's point of view.

We of the medical profession may claim Franklin as one of us, for he was a member of the Royal Medical Society of Paris and an honorary member of the Medical Society of London, besides holding membership in several medical societies in this country. He was largely instrumental in

, founding the first hospital in America, wrote the inscription for its corner-stone, served as clerk and later as president of its Board of Managers. He founded the College of Philadelphia which gave birth to the first school of medicine in America. He was a medical book publisher of note. He investigated and wrote upon many problems in medicine. To the medical profession he gave the Franklin electricity. He invented the bi-focal spectacles. He is the father of the modern scheme of ventilation. His ideas upon the contagiousness of colds which he stated one hundred and fifty years ago have within the last few years been shown by medical research to have been correct.

Franklin knew a large number of physicians in America and Europe, with many of whom he corresponded upon or discussed medical matters. Indeed, it is through this correspondence that we learn most of Franklin's study of and interest in medical matters. Leaders in our profession sought his opinion as that of a colleague and even came to him like pupils to a master. Franklin's title of "Doctor" was conferred upon him by the University of St. Andrews in 1759. The title was that of Doctor of Laws. He never received a medical degree as some have supposed he did. In 1762 the degree of D.C.L. was conferred upon him by the University of Oxford.

In short, Franklin's contributions to medical science taken together are of the highest scientific and practical value. It may indeed be doubted if they were equaled by those of any single contemporary medical man in America.

It seems best, for the sake of completeness, to begin this study of Franklin with some brief account of his life, even though to do so is to go over familiar ground.

A BRIEF SKETCH OF FRANKLIN'S LIFE.

Franklin was born January 6, 1706, in Boston, and was baptized the same day; he died in Philadelphia, April 17, 1790. He was the youngest son of a family of seventeen, and he relates that he can recollect when thirteen children sat down together at his father's table. He spent only two years at school. He early manifested a love for books, and tells us, "I do not remember when I could not read."

He was unable to get on with his brother James, for whom he worked as a printer and who was quick-tempered and domineer-

ing, so he ran away from home at the age of seventeen. After a short stay in New York and New Jersey, he arrived in Philadelphia.

Franklin entered Philadelphia, a runaway-apprentice boy, in 1721. Of this he tells us in his own words:

"I was in my working dress, my best clothes having gone around by sea. I was dirty from my journey, my pockets were stuffed with shirts and stockings, and I knew no soul, nor where to look for lodging. I was fatigued with travelling, and rowing, and want of rest, I was hungry; my whole stock of cash being a Dutch dollar and about a shilling in copper." He then tells us that he purchased three rolls of bread, one of which he placed under each arm, and the third he began to eat, and "Thus I went up Market Street as far as Fourth, past the door of Mr. Read, my future wife's father; she, standing at the door, saw me and thought I made, as I certainly did, a most ridiculous appearance."

At his funeral, fifty-nine years later, the Governor, the Chief Justice of the State, and the Mayor of Philadelphia served as pall-bearers; and among those in attendance were the chief officers of the federal, state and municipal governments, the members of the Legislature, the judges of the courts, the printers of Philadelphia, the members of the Philosophical Society, and the College of Physicians. Twenty thousand persons attended the funeral of the runaway printer boy. His body was buried in Christ Churchyard; and his grave with the simple inscription over it may be seen there to this day.

Surely there can be no greater contrast between the beginning and the end of any man's life than is to be seen in that of Franklin's, when we look at his entry into Philadelphia, and then at his homecoming from France, when he was easily the first citizen of Philadelphia, and had become known throughout the civilized world as a man eminent in philosophy, science, statecraft, and renowned for his literary productions, his humor, and plain common sense.

Soon after arriving in Philadelphia, Franklin entered the printing office of a man named Keimer as an apprentice.

Keith, the Governor of Pennsylvania, who seems to have been a most boastful individual with a lively imagination and a defective sense of honor, sent Franklin on a fool's errand to London, where he arrived, December 24, 1724, as penniless as when he entered Philadelphia. Here he secured employment and worked

at his trade as a printer. He returned to Philadelphia, October 11, 1726. In 1756, he again set out for England, where he acted as agent for three of the colonies; and he resided abroad until 1785, with the exception of two rather brief visits to America made during this period. The last nine years of this period, in many respects the most brilliant of his career, were spent in France. Then, in 1785, we find him returning to America, perhaps the most conspicuous figure in two continents, with the unbounded friendship and praise of the French people on one hand, and the gratitude and admiration of his countrymen on the other.

The years from 1726 to 1757, which Franklin spent in Philadelphia, were most eventful ones. It was on the achievements and habits of life he then developed that his subsequent world-wide fame rested. He was only twenty-one years old when he organized the Junto Club, which was at first called the "Leather Apron." He attained rapid success as a printer and a business man. By the time he was twenty-six years old he had become the editor of the *Pennsylvania Gazette*, by far the most important newspaper in the colonies; he had founded the Philadelphia Public Library, the first of its kind in America, and had begun the publication of *Poor Richard's Almanac*, which was destined to be known throughout the civilized world by many translations. He entered into political life at an early age and thus secured the "profitable job" of printing the Pennsylvania paper money.

Franklin's great industry, thrift, and business sagacity made him very prosperous. Indeed, in 1748, when he was only forty-two years old, he planned to retire from business and devote his life to scientific experiments and to philosophical studies. This was a year of peace. The treaty of Aix-la-Chapelle had been signed and it was thought that the prospects for continued peace were now good. Only two years before Franklin had begun his famous series of experiments in electricity, on which his fame as a scientist chiefly rests, and he now hoped to continue them in peace and quiet. His fortune was now ample for his needs. But he was destined to play many important parts before he left his native shores in 1756.

Franklin served in the Legislature several terms. In 1753 he was made Postmaster General for the colonies. Under him the office for the first time showed a balance on the right side. After Braddock's defeat, the Governor offered Franklin a gen-

eral's commission if he would attempt the capture of Fort Duquesne. It will be remembered that Braddock's expedition was fitted out by Franklin, to do which he pledged a large portion of his private fortune. Had Braddock listened to a few sage hints given him by Franklin, his crushing defeat might have been avoided. Franklin was really interested in or started nearly every good measure or institution which originated in Philadelphia during the years he lived there. This is not the place to recount his public services, his practical inventions, his scientific observations, or his literary achievements, so I must content myself with the mere mention of a few of them.

He organized a State Watch in Philadelphia; founded the Academy which was the beginning of the University of Pennsylvania and from which originated the first medical school in America; established the American Philosophical Society, which flourishes to this day. He served as Justice of the Peace and as a member of the Municipal Council. He was commissioned to treat with the Indians. He served as Postmaster General. He organized the first fire company and founded our first library in Philadelphia.

He had, with Dr. Bond, the honor of founding the first hospital in America, the Pennsylvania Hospital of Philadelphia. He was Colonel of a regiment; a member of Congress, a member of the Constitutional Convention, a Governor of a Colony, Colonial agent at London, and Ambassador to France.

Franklin investigated the phenomena of the whirlwinds, the Gulf Stream, and the thermometer. He made numerous experiments in producing cold by evaporation and was the first to do so. Sir William Herschel, the foremost physicist of his age, wrote Franklin asking his opinions on astronomy. By Franklin's influence John Bartram, of Philadelphia, was made American Botanist to George III. He interested himself to send rare seeds from America to Europe and from Europe to America. His observations on light are of the highest order.

Franklin began his philosophical and scientific studies at an early age and continued them with more or less interruption all through his life. His great European fame rests mainly upon his achievements in the field of science. Apparently no subject escaped his notice or failed to interest him. He wrote upon electricity, seismology, geology, meteorology, physics, chemistry, astronomy, mathematics, hydrography, horology, aeronautics,

navigation, agriculture, ethnology, paleontology, medicine, hygiene, and pedagogy.

During his long residence in England and France Franklin met a large number of persons prominent in the world of politics and science. When he sailed for England in 1756, he had gained high distinction as a man of letters, a diplomat, a philosopher, and a scientist; and this reputation steadily grew during his residence abroad. When he returned to Philadelphia, at the age of seventy-nine, after nine years' residence in France, to spend at home the four years that were yet to remain of his life, he was one of the most commanding figures of the civilized world; and his name was a household word in America, England and France. Franklin's autobiography ends with his arrival in London in 1756.

He made two visits to Scotland where he met many men of prominence—Hume, Robertson, Lord Kames, Alexander Dick, Dr. Cullen and Dr. Alexander Monro. He also met Adam Smith, with whom he discussed subjects in political economy. It is said that Smith afterward submitted much of the manuscript of "The Wealth of Nations" to Franklin for his suggestions. Upon his return to Scotland, a few months later, he renewed his acquaintance with these gentlemen, and for years afterwards he corresponded with several of them.

In a letter which he wrote to his son William, dated London, January 30, 1772, Franklin speaks of his second visit to Scotland, where he met his old friends and made new ones.

Summing up Franklin's manifold activities Parton says of him:

"We see him expatiating in his letters upon such diverse topics as chimneys and swimming; metallic roofs and spots on the sun; the average fall of rain and fireproof stairs; the torpedo, the arnomica, and the Northwest Passage; the magnet and the improved wheels; glass-blowing, Prince Rupert's drops, and the aurora borealis; the inflammatory gases, and the effects of vegetation upon the air and water. Nothing escaped him that transpired in philosophic circles, and his remarks on subjects agitated therein were always valuable, and frequently original. It is, however, the *method* of a philosopher that chiefly benefits those who come after him; the method being, as it were, the pathway, which when discovered and described, any intelligent mind can pursue, and reach interesting results. Franklin's method is particularly noticeable, because it was not that of a professor, whose

occupation it is to investigate, but that of a man naturally interested in the phenomena surrounding him, who studied them with a purely human curiosity."

Writing of his sojourn in London as a young apprentice, Franklin states that he was promised an introduction to Sir Isaac Newton and regrets that he never met him.

Upon his second trip to England Franklin met Dr. Shipley and stayed for long periods at his home, where he wrote his autobiography. Franklin always refers to Dr. Shipley as "The good Bishop of St. Asaphs." The two grew to be very warm friends. Dr. Shipley was a staunch friend of the colonies in the House of Lords when his brother Bishops were opposed to our cause.

Pitt was inaccessible to Franklin; and he never met that commanding figure in London, Dr. Samuel Johnson, who, as is well known, had a strong prejudice against Americans, believing the revolutionary cause unjust, and it is said declined to meet Franklin.

Priestley, Cavendish, and Lavoisier corresponded with Franklin on the subject of physics and chemistry. Sir Humphrey Davy, who had a fine appreciation of literary merit as well as of scientific attainment, writes:

"The style and manner of his publication on electricity are almost as worthy of admiration as the doctrine it contains. He has endeavored to remove all mystery and obscurity from the subject. He has written equally for the philosopher and for the uninitiated; and he has rendered his details amusing as well as perspicuous, elegant as well as simple. Science appears in his language in a dress wonderfully decorous, the best adapted to display her native loveliness."

Franklin was in touch with many of the most distinguished men of England. He enjoyed the company of Mrs. Montague and Garrick and Lord Shelburne. He knew Benjamin West, Horatio Gates, Charles Lee, John Hawkesworth, Burke, Hume, Kames, Sir John Pringle, Dr. Fothergill and Dr. Canton. He dined frequently with certain of these gentlemen.

In France, Franklin's acquaintance and prestige was even greater than it was in England. Among those with whom he came in contact in this country may be mentioned La Duchesse d'Enville, Duc de la Rochefoucauld, M. Turgot, Duc de Chaulnes, Comte de Crillon, Vicomte de Sarfield, M. Brisson, of the Royal

Academy of Sciences, Comte de Milly, Prince des Deuxponts, Comte d'Estaing, Marquis de Mirabeau, M. Beaugeard, Treasurer of the State of Brittany.

"John Adams declared that Franklin's reputation was more universal than that of Leibnitz or Newton, Frederick or Voltaire; and his character more beloved and esteemed than any or all of them. Surely there never lived a man more idolized. Everything about him was imitated and extolled—his spectacles, his marten fur cap, his brown coat, his bamboo cane. Men carried their canes and their snuffboxes *à la Franklin*, women crowned him with flowers, and every patrician house in Paris showed a Franklin portrait on the wall, and a Franklin stove in one of the apartments. Busts were made of him in Sevres china, set in a blue stone with a gold border, and barrels of miniatures made of the clay from Chaumont found eager purchasers. When Voltaire and Franklin kissed each other in the hall of the Academy, the enthusiastic sages and tribunes thundered their applause—'Behold Solon and Sophocles embrace!' " (Smyth.)

Franklin's conversation, it appears upon the competent testimony of Talleyrand, was as simple and direct as his writing, which, indeed, gives the greatest charm to his literary style. Speaking of his philosophical writings Jeffery remarked that, "The most ingenious and profound explanations are suggested as if they were the most natural and obvious way of accounting for the phenomena." Balzac expressed utmost delight in the writings of Franklin.

Franklin's scientific correspondence was carried on in nine languages. He was a member of one or more scientific societies in almost every country of Europe.

Thomas Jefferson had been appointed, March 10, 1785, Franklin's successor as minister plenipotentiary. He had already been seven months in France under commission to assist Franklin and Adams in negotiating commercial treaties with European powers. He had noticed the universal admiration and reverence with which Franklin was regarded. He said:

"There appeared to me more respect and veneration attached to the character of Franklin in France than to that of any other person in the same country, foreign or native. I had frequent opportunities of knowing particularly how far these sentiments were felt by the foreign ambassadors and ministers at the court of Versailles. * * * The succession to Dr. Franklin at the

court of France was an excellent school of humility. On being presented to any one as the minister of America, the commonplace question in such cases was, '^{Il est vous} Monsieur, qui remplacez le Docteur Franklin?' 'It is you, Sir, who replaces Dr. Franklin?' I generally answered, 'No one can replace him, Sir; I am only his successor.'

Jefferson also wrote to Congress: "Europe fixes an attentive eye on your reception of Dr. Franklin. He is infinitely esteemed. Do not neglect any mark of your approbation which you think proper. It will honor you here."

Summing up Franklin's character as a scientist and a philosopher Parton says:

"Franklin was the man of all others then alive who possessed in the greatest perfection the four requisites for the successful observation of nature or the pursuit of literature—a sound and great understanding, patience, dexterity, and an independent income.

"The great merit of Franklin in his investigation of nature was the soundness of his method, which was this: He collected his facts diligently; then he subjected his theory to every test that he could contrive; and, finally, he recorded the whole process with clearness and modesty."

In closing this short and very imperfect sketch of Franklin's life, I wish to quote a charming picture given us of him when he was in the evening of his life, quietly living in Philadelphia after his return from France. It illustrates "the ruling passion strong in death."

A scholarly Massachusetts clergyman, Manasseh Cutler, visited Franklin at his home in Philadelphia after his return from France. Under date of July 13, 1787, he makes a very interesting note in his diary, from which I quote:

"He showed us a glass machine for exhibiting the circulation of the blood in the arteries and veins of the human body. The circulation is exhibited by the passing of a red fluid from a reservoir into numerous capillary tubes of glass, ramified in every direction, and then returning in similar tubes to the reservoir, which was done with great velocity, without any power to act visibly upon the fluid, and had the appearance of perpetual motion.

"He seemed extremely fond, through the course of the visit, of dwelling on philosophical subjects, and particularly that of

Natural History; while the other gentlemen were swallowed up with politics. This was a favorable circumstance for me, for almost the whole of his conversation was addressed to me, and I was highly delighted with the extensive knowledge he appeared to have of every subject, the brightness of his memory, and clearness and vivacity of all his mental faculties, notwithstanding his age. His manners are perfectly easy, and everything about him seems to diffuse an unrestrained freedom and happiness. He has an incessant vein of humor, accompanied with an uncommon vivacity, which seemed as natural and involuntary as his breathing."

FRANKLIN'S RELATIONSHIP TO MEDICINE AND THE MEDICAL PROFESSION.

All his life Franklin took a deep interest in medical matters. He made many experiments and observations bearing directly or indirectly upon the science and art of medicine. Upon one occasion, in writing to his "Honored father and mother," he told them:

"I apprehend I am too busy in prescribing and meddling in the doctor's sphere, when any of you complain of ails in your letters. But as I always employ a physician myself when any disorder arises in my family, and submit implicitly to his orders in everything, so I hope you consider my advice, when I give any, only as a mark of my goodwill, and put no more of it in practice than happens to agree with what your doctor directs."

Writing to John Adams in 1781, he remarked:

"I hope your health is fully established. I doubt not but you have the advice of skillful physicians, otherwise I should presume to offer mine, which would be, though you find yourself well, to take a few doses of bark, by way of fortifying your constitution and preventing a return of your fever."

The Earl of Buchan upon one occasion credited Franklin with saving his life when he lay prostrated with fever. His physician, Dr. Simpson, ordered that the patient be blistered. Franklin dissented from this view, and soon afterward the patient made a speedy recovery.

To Rev. Samuel Johnson Franklin wrote the following letter, giving some sound medical advice:

"DEAR SIR: I am sorry to hear of your illness. If you have not been used to the fever-and-ague let me give you one caution.

Don't imagine yourself thoroughly cured, and so omit the use of the bark too soon. Remember to take the preventing doses faithfully. If you were to continue taking a dose or two every day for two or three weeks after the fits have left you, 'twould not be amiss. If you take the powder mixed quickly in a tea-cup of milk, 'tis no way disagreeable, but looks and even tastes like chocolate. 'Tis an old saying: That one ounce of prevention is worth a pound of cure—and certainly a true one, with regard to the bark, a little of which will do more in preventing the fits than a great deal in removing them.

"But if your health would permit I should not expect the pleasure of seeing you soon. The smallpox spreads apace, and now in all quarters; yet as we have only children to have it, and the doctors inoculate apace, I believe they will soon drive it through the town, so that you may probably visit us with safety in the spring."

Franklin's old friend, Dr. Peter Collinson, died from suppression of urine in 1768. Writing to Dr. Fothergill Franklin makes mention of the fact and refers to a similar illness from which Fothergill had recovered, and he adds: "As I am sometimes apprehensive of the same disorder, I wish to know the means that were used and succeeded in your case, and shall be exceedingly obliged to you for communicating them when you can do it conveniently."

In "Poor Richard," Franklin has a number of jokes at the doctor's expense. Among them are these:

"Beware of the young doctor and the old barber."

"He's the best physician that knows the worthlessness of the most medicines."

"Many medicines, few cures."

"There's more old drunkards than old doctors."

"God heals, and the doctor takes the fees."

"Don't misinform your doctor nor your lawyer."

"Don't go to the doctor with every distemper, nor to the lawyer with every quarrel, nor to the pot for every thirst."

"Poor Richard" also offers some excellent hygienic and dietetic suggestions. For example:

"We are not so sensible of the greatest health as of the least sickness."

"A full belly makes a dull brain; the muses starve in a cook's shop."

"Eat few suppers and you'll need few medicines."
"A full belly is the mother of all evils."
"I saw few die of hunger; of eating, 100,000."
"He that steals the old man's supper does him no wrong."
"Three meals a day is bad living."
"If thou wouldst live long, live well; for folly and wickedness shorten life."

From "Poor Richard's" observations, which are of general application, I quote four which every physician would do well to lay to heart:

"Want of care does us more damage than want of knowledge."
"The most exquisite folly is made of wisdom spun too fine,"
"What signifies knowing the names, if you know not the natures of things."

"No man e'er was glorious who was not laborious."

Although Franklin had his jokes at the expense of physic and the physician, he had a great respect for both. For all through his life he took a deep interest in medicine and numbered physicians among his closest and most intimate friends. He talked to and wrote to many physicians in America, England, and France, not only upon medical subjects, but also upon other matters of scientific interest and upon philosophy and politics.

Among his American friends were Drs. Thomas and Phineas Bond, John Redman, Benjamin Rush, William Shippen, John Morgan, Thomas Cadwalader and John Jones, of Philadelphia, Drs. Cadwallader Colden and John Bard, of New York, and Dr. Benjamin Waterhouse, of Boston.

In England Franklin met many medical men. He was on intimate terms with Sir John Pringle and Dr. Fothergill and knew Sir William Watson, William Heberden, Edward Bancroft and William Hewson. A distinguished English physician, John Coakley Lettsom, wrote a life of Franklin. In Scotland Franklin met Dr. Cullen, Dr. Alexander Monro and other physicians of the Edinburgh school.

Among the French physicians with whom Franklin came in contact or corresponded were Dubourg, Guillotin, and Vicq d'Azyr. He was a regular correspondent with Dr. Jan Ingenhousz, of Vienna, the court physician to Maria Theresa and Joseph II.

These medical men at home and abroad, the leaders in their

profession, sought Franklin's opinions as an equal colleague, and even came to him in the attitude of pupils to a master.

In Philadelphia Franklin did an immense deal for medicine and the medical profession. With Dr. Bond he founded the first hospital in America. From the College of Philadelphia, which he founded, grew the first medical school in America. He published several medical works, and by his criticism and advice rendered material assistance to the authors. Rush, Bard, Cadwalader, and Thomas Bond dedicated medical works to him. On one occasion Franklin had to remonstrate with Rush, who desired to make use of a most "extravagant encomium" in dedicating one of his books to him. Rush, after modifying the dedication, published the book under the patronage of Franklin's great name.

Dr. Thomas Cadwalader, the first teacher of anatomy in North America, aided Franklin in establishing the Philadelphia Library and the Pennsylvania Hospital.

Franklin's friendship for medical men of Philadelphia and students beginning the study of medicine is shown in the following letter written by him to William Cullen, M.D., from London, October 21, 1761. It may be supposed that Shippen and Morgan were fortunate indeed to be introduced to the great Edinburgh master by Franklin.

"I thank you for the civilities you were so good as to shew my friend, Mr. Shippen, whom I took the liberty of recommending to your notice the last year. Give me leave to recommend one more to your advice and countenance. The bearer, Mr. Morgan, who purposes to reside sometime in Edinburgh for the completion of his studies in Physic, is a young man of Philadelphia, whom I have long known and greatly esteem; and as I interest myself in what relates to him, I cannot but wish him the advantages of your conversation and instructions. I wish it also for the sake of my country, where he is to reside, and where I am persuaded he will be not a little useful. I am, with the greatest esteem and respect, dear sir, your most obedient and most humble servant,

B. FRANKLIN."

Most of the American physicians who were friends and co-workers with Franklin are well known and need no introduction. But brief notes on a few who are not so well known may be of interest in this place.

Dr. Benjamin Waterhouse, who was professor of Theory and Practice of Medicine in Harvard University, had taken his degree at Leyden and was the first physician in this country to practice vaccination. In July, 1800, he vaccinated his own children from vaccine virus which he procured from Europe. Dr. Waterhouse was a nephew of Dr. Fothergill with whom Franklin was on such terms of intimate friendship.

In his "History of Medicine in the United States," Packard gives us a good deal of information concerning Dr. John Jones, who attended Franklin in his last illness. His father and grandfather before him were physicians, the former having come to Philadelphia with Penn. Dr. Jones published a treatise on surgery, which passed through three editions, the third in 1795. Dr. Packard tells us that, "Dr. Jones had studied medicine under Dr. Thomas Cadwalader, of Philadelphia, and his book is dedicated to him in terms of warm admiration. After completing his studies with Dr. Cadwalader, Dr. Jones went abroad and pursued his medical studies in London, Edinburgh, Leyden and France. He received the degree of M.D. from the University of Rheims. He performed the first lithotomy ever done in the city of New York, and was professor of surgery in the Medical School of New York. In 1780 he removed to Philadelphia and succeeded to Dr. John Redman's place as one of the physicians to the Pennsylvania Hospital. He was one of the founders of the College of Physicians of Philadelphia and its first vice-president. He was a friend of Benjamin Franklin, and attended that great man in his last illness, afterwards publishing a very interesting account of the philosopher's last hours. Dr. Jones died in June, 1791, in the sixty-third year of his age."

Dr. Cadwallader Colden was a Scotchman, educated in Aberdeen and Edinburgh. He came to Philadelphia in 1708. In 1718 he settled in New York. He was the author of several medical essays and a botanist of note. He occupied many positions of public trust and became quite wealthy. He died in 1776.

We get a very good glimpse of Franklin through the eyes of Rush, who refers to him a number of times in his diary, from which the following passages are quoted:

"1786, August. I waited on the doctor with a Dr. Minto. He said he believed that tobacco would in a few years go out of use. That about thirty years ago, when he went to England, smoking was universal in taverns, coffee-houses, and private families, but

that it was now generally laid aside, that the use of snuff, from being universal in France, was become unfashionable among genteel people, no person of fashion under thirty years of age now snuffed in France. He added that Sir John Pringle and he had observed that tremors of the hands were more frequent in France than elsewhere, and probably from the excessive use of snuff. They once saw in a company of sixteen but two persons who had not these tremors at a table in France. He said Sir John Pringle was cured of a tremor by leaving off snuff. He concluded that there was no great advantage in using tobacco in any way, for that he had kept company with persons who used it all their life, and no one had ever advised him to use it. The doctor in the 81st year of his age declared he had never snuffed, chewed, or smoked.

"Sept. 22d. Waited upon Dr. Franklin with Dr. Thibou, of Antigua. The doctor said few but quacks ever made money by physic, and that no bill drawn upon the credulity of the people of London by quacks, was ever protested. He ascribed the success of quacks partly to patients extolling the efficacy of the remedies they took from them rather than confess their ignorance and credulity, hence it was justly said, 'quacks were the greatest liars in the world, except their patients.'

"November. Spent half an hour with Doctor in company with the Rev'd. Mr. Bisset and Mr. Goldborough. He said Sir John Pringle once told him 92 fevers out of 100 cured themselves, 4 were cured by art, and 4 proved fatal. About the end of this month I saw him alone. He talked of climates; I borrowed some hints from the conversation for the essay on climates."

That Franklin was a man of the world and well acquainted with the temper of scientific societies as regards their constitution and membership, is well seen from a letter which he wrote to Rush from London, July 22, 1774. He says:

"DEAR SIR:

"I received your Favour of May 14, with the very ingenious Oration you delivered at the Society, for which I thank you. The Bookseller you had likewise sent it to, M. Dilly, being desirous of Dr. Huck's Opinion & Mine as to its Publication, we had a little Consultation upon it; the Result of which was, that tho' the Piece had in many Respects a great deal of Merit, yet as there were

some Particulars that would be excepted to by the medical People here, many of whom are in the Royal Society & have great Weight there; and as the Society generally is of late grown more difficult in the Admission of new Members, several Candidates being this last year rejected, and a Criticism to the Disadvantage of your Piece in the Reviews or otherwise might prejudice some Votes against you; we thought it best the Publication should be postponed till after the Ballot for your Election; it being intended by us to put you up as a Candidate at the next meeting of the Society, which will be in November, and we are unwilling to hazard your being refused, as it would be better not to propose you, than to do it without a moral Certainty of Success. We therefore advised the Bookseller not to print it till Winter, which he the more readily agreed to, as that is the best Season for publishing."

In a letter to Rush three days later he writes:

"I took the Liberty last Year of recommending to the Society for Election as a Member, our Friend (and Zealous Friend of America) M. Barbeau Dubourg of Paris. I have never heard whether it was done or not. You know his Merit in Science to be such as would do honour to any Society in Europe. Is it possible there could arise any Objection to his Admission?"

On the occasion of Braddock's defeat, Franklin, by his prudence and common sense, saved his two friends, the Drs. Bond, considerable embarrassment, of which he tells us in his autobiography:

"Before we had the news of this defeat (Braddock's), the two Doctors Bond came to me with a subscription paper for raising money to defray expenses of a grand firework, which it was intended to exhibit at a rejoicing on receipt of the news of our taking Fort Duquesne. I looked grave and said it would, I thought, be time enough to prepare for the rejoicing when we knew we should have occasion to rejoice. They seemed surprised that I did not immediately comply with their proposal. 'Why the D——l!' says one of them, 'you surely don't suppose that the fort will not be taken?' 'I don't know that it will not be taken, but I know that the events of war are subject to great uncertainty.' I gave them the reasons of my doubting, the subscription was drop'd, and the projectors thereby missed the mortification they would have undergone if the firework had been pre-

pared." Dr. Bond afterward said that he did not like Franklin's forebodings.

It will be remembered that Franklin gave Dr. John Morgan a letter of introduction to Cullen, of Edinburgh. Not many years later, he advised with Bond as to the relative claims of London and Edinburgh as centers of medical teaching, since Dr. Bond was then proposing to send his son abroad that he might have some of the same advantages that he had had before him. Under date of London, February 5, 1772, Franklin writes:

"I suppose your son Richard will spend some time in London, where by what I have heard, Physic and Surgery may be studied to as great Advantage as in any Part of the World, by Attending the Anatomical Lectures and Hospitals, conversing with the most eminent Practitioners, and Reading under their Advice and Direction: And yet the general Run is at present to Edinburgh, there being at the Opening of the Schools when I was there in November last, a much greater Number of medical Students than had ever been known before. They have indeed a Set of Able Professors in the several Branches, if common Opinion may be rely'd on. I who am no Judge in that Science, can only say that I found them very sensible Men, and agreeable Companions. I will endeavour to obtain Sir John Pringle's Advice in the Affair, as you desire. Every Wednesday Evening he admits young Physicians and Surgeons to a Conversation at his House, which is thought very improving to them. I will endeavour to introduce your Son there when he comes to London. And to tell you frankly my Opinion, I suspect there is more valuable knowledge in Physic to be learnt from the honest candid Observation of an old Practitioner, who is past all desire of more Business, having made his Fortune, who has none of the Professional Interest in keeping up a Parade of Science to draw Pupils, and who by Experience has discovered the Inefficacy of most Remedies and modes of Practice, than from all the formal Lectures of all the Universities upon Earth. I like therefore a Physician's breeding his son to Medicine, and wish the Art to be continued, with the Race, as thinking that must be upon the whole most for the Publick Welfare."

In England Franklin was on most intimate terms with Priestley and Dr. Fothergill, and Sir John Pringle, the president of the London Medical Society. In 1787 he was made an honorary

member of this Society, the meetings of which he had often attended when he resided in London.

Jefferson relates an incident of Franklin which is well worth quoting. "When I was in London, in such a year, there was a weekly club of physicians, of which Sir John Pringle was President, and I was invited to attend, by my friend, Dr. Fothergill. Their rule was to propose a thesis one week and discuss it the next. I happened there when the question to be considered was whether physicians have, on the whole, done most good or harm? The young members, particularly, having discussed it very learnedly and eloquently till the subject was exhausted, one of them observed to Sir John Pringle, that although it was not usual for the President to take part in a debate, yet they were desirous to know his opinion on the question. He said they must first tell him whether under the appellation of physicians they meant to include *old women*; if they did he thought they had done more good than harm, otherwise more harm than good."

Franklin's friend, Sir John Pringle, was a man of excellent parts. He had studied with the illustrious Boerhaave. He did much to prevent dysentery and hospital fevers, thus improving the condition of the English army. With Sir John, Franklin once drove in a post-chaise through Scotland, Switzerland, Holland, and Germany. Franklin held Sir John in the highest esteem and affection. Upon the news of his death he wrote to Dr. Ingenhousz, October 2, 1781, lamenting their loss. "We have lost our common Friend, the excellent Pringle. How many pleasing hours you and I have pass'd together in his Company!"

With Dr. Fothergill Franklin discussed questions of politics as well as those of medicine; and he held a high place in his esteem and affection. Upon the death of Fothergill he wrote a letter of condolence to Dr. Benjamin Waterhouse, a nephew of Fothergill, who had studied at Leyden and came to America and set up a practice, and who was Professor of Medicine at Harvard (1783-1812).

"I think a worthier Man never lived. For besides his constant Readiness to serve his Friends, he was always studying and projecting something for the Good of his Country and of Mankind in general, and putting others, who had it in their Power, on executing what was out of his own reach; but whatever was within it he took care to do himself; and his incredible Industry and unwearyed Activity enabled him to do much more than can

now be ever known, his Modesty being equal to his other Virtues."

Another of Franklin's English medical friends was Dr. William Hewson, a brilliant English surgeon who was cut down in his usefulness by an attack of blood poisoning. Hewson married Miss Mary Stevenson, to whom Franklin wrote so many delightful and sprightly letters.

During his stay in London, Franklin was a frequent visitor to the Royal Society Club, if he was not a member. He was a member of a London Coffee-House, at Ludgate Hill. Here he met Dr. Richard Price, Dr. Priestley, Dr. Fothergill, Peter Collinson, Dr. Hawksworth, and Stanley, the composer, who were all members or frequenters of this club, the weekly meetings of which Franklin keenly enjoyed, and remembered with fondness to the close of his life.

The physicians of France honored and esteemed Franklin no less than did their colleagues in America and England.

Vicq d'Azyr, physician to the queen of France, founded the Royal Society of Medicine in 1776 and became its perpetual secretary. Franklin was elected a foreign associate, being the first to receive this honor. Vicq d'Azyr wrote to him: "The Royal Society recognizing the talents and brilliancy of the physicians of America, we wish to confer the honor of correspondent upon some of them, and we judge that that honor would be doubled by passing through Franklin's hands, and therefore hope that he will present the diplomas."

Dr. Barbeu Dubourg, one of the most distinguished physicians in Paris, a member of many societies, translated Franklin's works into French, in 1772. During a long and affectionate friendship he always addressed Franklin as "Mon cher maitre."

Dubourg was a member of the Royal Society of Medicine, the Royal Society of Montpellier, the Medical Society of London, and the Academy of Sciences of Stockholm. He was born at Mayence, February 12, 1709. Like his brothers he studied theology, and abandoned it for the practice of medicine.

Another of Franklin's Parisian doctor friends was Dr. Guillotin (1788-1814), who was Professor of Anatomy, Physiology, and Pathology in Paris. He assisted Franklin and Lavoisier in investigating mesmerism. He consulted Franklin about a project of emigration to America. Letters were frequent between them.

His name was destined to be forever linked to the French instrument of execution.

Gastellier, a French medical writer, asked Franklin to allow him to dedicate to him his treatise upon "Specifics in Medicine," a work which was recognized by the Royal Academy of Medicine. The Marquis of Mirabeau interceded for him with Franklin.

Franklin carried on an extended correspondence with Dr. Jan Ingenhousz, of Vienna, the court physician to Maria Theresa and Joseph II. Together they travelled in England and France. On one occasion, Franklin's advice was sought by Dr. Ingenhousz concerning the propriety of inoculating the young princess of the imperial family.

Jean Baptiste Le Roy was highly esteemed by Franklin. Both were members of the French Academy.

On the recommendation of Franklin, Dubourg and Ingenhousz were made members of the American Philosophical Society.

THE PENNSYLVANIA HOSPITAL.

Franklin helped found not only the first hospital, but also the first medical school in America; and if he had no other claim upon us, he should be forever highly honored by the American Medical Profession.

Franklin's account of the founding of the Pennsylvania Hospital, taken from his autobiography, at once challenges our interest and admiration. The successful method of raising funds for America's first hospital devised by Franklin has been copied by many hospital managers in the succeeding generations down to this day.

"In 1751, Dr. Thomas Bond, a particular friend of mine, conceived the idea of establishing a hospital in Philadelphia (a very beneficent design, which has been ascrib'd to me, but was originally his), for the reception and cure of poor sick persons, whether inhabitants of the province or strangers. He was zealous and active in endeavoring to procure subscriptions for it, but the proposal being a novelty, in America, and at first not well understood, he met with but small success.

"At length he came to me with the compliment that he found there was no such thing as carrying a public-spirited project through without my being concerned in it. 'For,' says he, 'I am often ask'd by those to whom I propose subscribing, "Have you

consulted Franklin upon this business?" And when I tell them that I have not (supposing it rather out of your line) they do not subscribe, but say they will consider of it.' I inquired into the nature and probable utility of his scheme, and receiving from him a very satisfactory explanation, I not only subscribed to it myself, but engaged heartily in the design of procuring subscriptions from others. Previously, however, to the solicitation, I endeavored to prepare the minds of the people by writing on the subject in the newspapers, which was my usual custom in such cases, but which he had omitted.

"The subscriptions afterwards were more free and generous; but beginning to flag, I saw they would be insufficient without some assistance from the Assembly, and therefore proposed to petition for it, which was done. The country members did not at first relish the project; they objected that it could only be serviceable in the city, and therefore the citizens themselves should be at the expense of it; and they doubted whether the citizens themselves approved of it. My allegation on the contrary, that it met with such approbation as to leave no doubt of our being able to raise two thousand pounds by voluntary donations, they considered as a most extravagant supposition, and utterly impossible.

"On this I formed my plan; and, asking leave to bring a bill for incorporating the contributors according to the prayer of their petition and granting them a blank sum of money, which leave was obtained chiefly on the consideration that the House could throw the bill out if they did not like it, I drew it so as to make the important clause a conditional one, *viz.*: And be it enacted, by the authority aforesaid, that when the said contributors shall have met and chosen their managers and treasurer, *and shall have raised by their contributions a capital stock of —— value* (the yearly interest of which is to be applied to the accommodating of the sick poor in the said hospital, free of charge for diet, attendance, advice, and medicine), *and shall make the same appear to the satisfaction of the speaker of the Assembly for the time being*, that then it shall and may be lawful for the said speaker, and he is hereby required, to sign an order on the provincial treasurer for the payment of two thousand pounds, in two yearly payments, to the treasurer of the said hospital, to be applied to the founding, building, and finishing of the same).

"This condition carried the bill through; for the members,

who had opposed the grant, now conceived they might have the credit of being charitable without the expense, agreed to its passage, and then, in soliciting the subscriptions among the people, we urged the conditional promise of the law as an additional motive to give, since every man's donation would be doubled; thus the clause worked both ways. The subscriptions accordingly soon exceeded the requisite sum, and we claimed and received the public gift, which enabled us to carry the design into execution. A convenient and handsome building was soon erected; the institution has by constant experience been found useful, and flourishes to this day; and I do not remember any of my political manœuvres, the success of which gave me at the time more pleasure, or wherein, after thinking of it, I more easily excused myself for having made some use of cunning."

Although the idea of founding the Pennsylvania Hospital originated with Dr. Thomas Bond, to whom should be given full credit, yet, without the active interest and aid of Franklin, it is unlikely that the hospital would have been built at that time. The petition to the Assembly of Pennsylvania was drawn up by Franklin. The first President of the Board of Managers was Joshua Crosby; and Benjamin Franklin filled the office of clerk. Upon the death of Mr. Crosby, in 1754, Franklin succeeded him as President of the Board of Managers. The design for the seal for the hospital was devised by Franklin and Dr. Thomas Bond. The inscription for the corner-stone for the hospital was written by Franklin and reads as follows:

IN THE YEAR OF CHRIST
MDCCCLV
GEORGE THE SECOND HAPPILY REIGNING
(FOR HE SOUGHT THE HAPPINESS OF HIS PEOPLE)
PHILADELPHIA FLOURISHING
(FOR ITS INHABITANTS WERE PUBLICK SPIRITED)
THIS BUILDING
BY THE BOUNTY OF THE GOVERNMENT,
AND OF MANY PRIVATE PERSONS,
WAS PIOUSLY FOUNDED,
FOR THE RELIEF OF THE SICK AND MISERABLE;
MAY THE GOD OF MERCIES
BLESS THE UNDERTAKING.

FRANKLIN'S CONNECTION WITH THE FIRST MEDICAL SCHOOL IN
AMERICA, AFTERWARDS THE MEDICAL DEPARTMENT OF THE
UNIVERSITY OF PENNSYLVANIA.

The College of Philadelphia, which had been founded by Franklin, organized its medical department through the efforts of Drs. John Morgan and William Shippen, in 1766, when systematic lectures were begun in this the first medical school in the United States. The first commencement of the Medical Department of the College of Philadelphia was held in 1768. Later dissensions occurred, and on November 27, 1779, the Legislature repealed the charter of the College of Philadelphia and conferred all the powers and privileges which it had enjoyed upon "The University of the State of Pennsylvania." The friends of the College were very much displeased by this action and worked steadily and persistently for the repeal of the bill. They finally succeeded, and on March 6, 1783, the old college charter again became operative. "Benjamin Franklin was in the forefront of those who fought for the rights of the College. He had been in Europe at the time the bill constituting the University had been passed. The founders of the University had taken the liberty of making him one of its trustees, but immediately on his return he had withdrawn his name and joined with his old colleagues of the College." (Packard.)

On November 17, 1789, the trustees of the College, of which Franklin was now President, published a set of rules governing the conferring of medical degrees.

FRANKLIN'S RULES OF HEALTH; WITH SOME ACCOUNT OF HIS
OWN HEALTH.

Franklin states that his father "had an excellent constitution of the body," and that "I never knew either my father or mother to have any sickness but that of which they dy'd, he at 89, and she at 85 years of age."

Franklin must, therefore, have inherited his splendid constitution from his parents, without which his career could have been neither so long nor so glorious.

He inculcated the habit of moderation in eating and drinking, and warned against free indulgence of alcoholic drinks at a very early age. When sixteen years of age, he wrote in the *New England Courant* the following lines on drinking:

"I doubt not but *moderate* drinking has been improved for the Diffusion of Knowledge among the ingenious Part of Mankind,

who want the Talent of a ready Utterance, in order to discover the Conception of their Minds in an entertaining and intelligible Manner. 'Tis true, drinking does not improve our Faculties, but it enables us to use them, and therefore, I conclude, that much Study and Experience, and a little Liquor are of absolute necessity for some tempers, in order to make them accomplished Orators."

It was about this time that he became a vegetarian, a practice which he followed up after he left Boston and became a resident of Philadelphia. Of this he tells us in his autobiography from which I quote.

"When about sixteen years of age I happened to meet with a book, written by one Tryon, recommending a vegetable diet. I determined to go into it. My brother, being yet unmarried, did not keep house, but boarded himself and his apprentices in another family. My refusing to eat flesh occasioned an inconveniency, and I was frequently chid for my singularity. I made myself acquainted with Tryon's manner of preparing some of his dishes, such as boiling potatoes or rice, making hasty pudding, and a few others, and then proposed to my brother, that if he would give me, weekly, half the money he paid for my board, I would board myself. He instantly agreed to it, and I presently found that I could save half what he paid me. This was an additional fund for buying books.

"I believe I have omitted mentioning that, in my first voyage from Boston, being becalm'd off Block Island, our people set about catching cod, and hauled up a good many. Hitherto I had stuck to my resolution of not eating animal food, and on this occasion I consider'd with my master Tryon, the taking every fish as a kind of unprovoked murder, since none of them had or ever could do us any injury that might justify the slaughter. All this seemed very reasonable. But I had formerly been a great lover of fish, and, when this came hot out of the frying-pan, it smelt admirably well. I balanced sometime between principle and inclination, till I recollect'd that, when the fish were opened, I saw smaller fish taken out of their stomachs; then thought I, 'If you eat one another, I don't see why we mayn't eat you.' So I din'd upon cod very heartily, and continued to eat with other people, returning only now and then occasionally to a vegetable diet. So convenient a thing it is to be a *reasonable creature*, since it enables

one to find or make a reason for every thing one has a mind to do.

"Keimer wore his beard at full length, because somewhere in the Mosaic law it is said, 'Thou shalt not mar the corners of thy beard.' He likewise kept the Seventh day, Sabbath; and these two points were essentials with him. I disliked both; but agreed to admit them upon condition of his adopting the doctrine of using no animal food. 'I doubt,' said he, 'my constitution will not bear that.' I assured him it would, and that he would be better for it. He was usually a great glutton, and I promised myself some diversion in half starving him. He agreed to try the practice, if I would keep him company. I did so, and we held it for three months. We had our victuals dress'd and brought to us by a woman in the neighborhood, who had from me a list of forty dishes, to be prepar'd for us at different times, in all which there was neither fish, flesh nor fowl, and the whim suited me the better at this time from the cheapness of it, not costing us above eighteen pence sterling each per week. I have since kept several Lents most strictly, leaving the common diet for that, and that for the common, abruptly, without the least inconvenience, so that I think there is little in the advice of making those changes by easy gradations. I went on pleasantly, but poor Keimer suffered grievously, tired of the project, longed for the flesh-pots of Egypt, and order'd a roast pig. He invited me and two women friends to dine with him; but, it being brought too soon upon the table, he could not resist the temptation, and ate the whole before we came."

Writing of his first sojourn in London, when he worked there as a printer, Franklin makes these observations in his autobiography:

"At my first admission into this printing-house I took to working at press, imagining I felt a want of bodily exercise I had been us'd to in America, where presswork is mixed with composing. I drank only water; the other workmen, near fifty in number, were great guzzlers of beer. On occasion, I carried up and down stairs a large form of types in each hand, when others carried but one in both hands. They wondered to see, from this and several instances, that the Water-American, as they called me, was stronger than themselves, who drank strong beer! We had an alehouse boy who attended always in the house to supply the workmen. My companion at the press drank every day a

pint before breakfast, a pint at breakfast with his bread and cheese, a pint at dinner, a pint in the afternoon about six o'clock, and another when he had done his day's work. I thought it a detestable custom; but it was necessary, he supposed, to drink strong beer that he might be *strong* to labor. I endeavoured to convince him that the bodily strength afforded by beer could only be in proportion to the grain of flour of the barley dissolved in the water of which it was made; and that there was more flour in a pennyworth of bread; and therefore, if he would eat that with a pint of water, it would give him more strength than a quart of beer. He drank on, however, and had four or five shillings to pay out of his wages every Saturday night for that muddling liquor; an expense I was free from. And thus these poor devils keep themselves always under." While working as a printer in London he tells us that "Our supper" was only half an anchovy each, on a very little strip of bread and butter, half a pint of ale between us." The object of this economical fare was really to save money with which to buy books rather than for hygienic reasons.

Franklin approved of water used internally and also externally. Swimming, he held, was one of the most healthful and agreeable exercises in the world and a remedy for diarrhoea. He strongly advocated warm baths, "for cleanliness and purifying the skin"; and he states, "I speak from my own experience, and that of others, to whom I have recommended this."

In 1735 he suffered from some ailment characterized by suppuration from the lungs. Just prior to this time, he thought he had avoided an illness by drinking very freely of cold water and by sweating himself. This treatment is interesting; for at that time and for years afterward it was the practice to forbid fever patients water.

To relieve some skin affection of which he began to suffer in 1778, he states, "I took a hot bath twice a week, two hours at a time." He assures us that he derived great benefit from this prolonged bathing and suffered afterwards by neglecting to take them. Some years later, he took a daily prolonged warm bath in a copper vessel shaped like a slipper. Cutler states he would sit in the heel of this vessel with his legs under the vamp, while on the instep he had fixed a place for his books so that he might read while in the bath.

Franklin's early advocacy of the free use of water internally

and externally, including the use of the prolonged warm bath, seems very remarkable in view of some of the later developments in medical practice. The prolonged warm bath in skin affections and as a sedative for the various psychoses seems to us very modern; and it is only a very few years since the bath has become the chief therapeutic agent in the treatment of typhoid and other fevers.

Franklin, too, was a strong advocate of fresh air, as will be seen later.

He argued against the use of tobacco and never indulged in it. Although very temperate in the use of alcoholic liquors in his earlier life, he appears to have grown rather indulgent in this respect as he grew older.

Franklin formulated the following hygienic and dietetic rules when he published "Poor Richard."

Rules of Health and Long Life, and to Preserve from Malignant Fevers, and Sickness in General.

"Eat and drink such an exact quantity as the constitution of thy body allows of, in reference to the service of the mind.

"They that study much, ought not to eat so much as those that work hard, their digestion being not so good.

"The exact quantity and quality being found out, is to be kept to constantly.

"Excess in all other things whatever, as well as in meat and drink, is also to be avoided.

"Youth, age and sick require a different quantity.

"And so do those contrary complexions; for that which is too much for a flegmatick man, is not sufficient for a choleric.

"The measure of food ought to be (as much as possibly may be) exactly proportionable to the quality and condition of the stomach, because the stomach digests it.

"That quantity that is sufficient, the stomach can perfectly concoct and digest, and it sufficeth the due nourishment of the body.

"A greater quantity of some things may be eaten than of others, some being of lighter digestion than others.

"The difficulty lies, in finding out an exact measure; but eat for necessity, not pleasure, for lust knows not where necessity ends.

"Would'st thou enjoy a long life, a healthy body, and a vigor-

ous mind, and be acquainted also with the wonderful works of God? Labor in the first place to bring thy appetite into subjection to reason."

Rules to Find Out a Fit Measure of Meat and Drink.

"If thou eatest so much as makes thee unfit for study, or other business, thou exceedest the due measure.

"If thou art dull and heavy after meat, it's a sign thou hast exceeded the due measure; for meat and drink ought to refresh the body, and make it cheerful, and not to dull and oppress it.

"If thou findest these ill symptoms, consider whether too much meat, or too much drink occasions it, or both, and abate by little and little, till thou findest the inconveniency removed.

"Keep out of the sight of feasts and banquets as much as may be; for 'tis more difficult to refrain good cheer when it's present, than from the desire of it when it is away; and like you may observe in the objects of all the other senses.

"If a man casually exceeds, let him fast the next meal, and all may be well again, provided it be not too often done; as if he exceed at dinner, let him refrain at supper, etc.

"A temperate diet frees from diseases; such are seldom ill, but if they are surprised with a sickness, they bear it better, and recover sooner; for most distempers have their original from repletion.

"Use now and then, a little exercise a quarter of an hour before each meal, as to swing your arms about with a small weight in each hand; to leap, or the like, for that stirs the muscles of the breast.

"A temperate diet arms the body against all external accidents; so that they are not so easily hurt by heat, cold or labor; if they at any time should be prejudiced, they are more easily cured, either of wounds, dislocations, or bruises.

"But when malignant fevers are rife in the country or city where thou dwelst, 'tis advisable to eat and drink more freely, by way of prevention, for these diseases that are not caused by repletion, and seldom attack full-feeders.

"A sober diet makes a man die without pain; it maintains the senses in vigor; it mitigates the violence of passions and affections.

"It preserves the memory, it helps the understanding, it allays the heat of lust; it brings a man to a consideration of his latter

end; it makes the body a fit tabernacle for the Lord to dwell in; which makes us happy in this world, and eternally happy in the world to come, through Jesus Christ our Lord and Saviour."

Writing to his son William from London, on August 19, 1772, Franklin discusses, in a most interesting way, the value of exercise.

"In yours of May 14th, you acquaint me with your indisposition, which gave me great concern. The resolution you have taken to use more exercise is extremely proper; and I hope you will steadily perform it. It is of the greatest importance to prevent diseases, since the cure of them by physic is so very precarious.

"In consideration of the different kinds of exercise, I have thought, that the *quantum* of each is to be judged of, not by time or distance, but by the degree of warmth it produces in the body. Thus, when I observe, if I am cold when I get into a carriage in a morning, I may ride all day without being warmed by it; that, if on horseback, my feet are cold, I may ride some hours before they become warm; but if I am ever so cold on foot, I cannot walk an hour briskly, without glowing from head to foot by the quickened circulation, I have been ready to say (using round numbers without regard to exactness, but merely to mark a great difference) that there is more exercise in *one* mile's riding on horseback, than in *five* in a coach; and more in *one* mile's walking on foot, than *five* on horseback; to which I may add, that there is more in walking *one* mile up and down stairs, than in *five* on a level floor. The two latter exercises may be had within doors when the weather discourages going abroad; and the last may be had when one is pinched for time, as containing a great quantity of exercise of the latter compendious kind. By use of it I have in forty swings quickened my pulse from sixty to a hundred beats in a minute, counted by a second watch; and I suppose the warmth generally increases with quickness of pulse."

As Franklin grew older he relaxed many of the excellent hygienic and dietetic rules by which he had been governed in his early life. Indeed, he himself often violated the maxims which were inculcated by "Poor Richard."

That he grew to appreciate the pleasures of the table may be seen by the following remark he once made:

"Many people are fond of accounts of old buildings and monuments, but for one, I confess that if I could find in any

Italian travels a receipt for making Parmesan cheese it would give me more satisfaction than a transcript of any inscription from any old stone whatever."

In 1757 he referred to himself as "Dr. Fatsides," and even before this he admits to "a little natural indolence." "In 1778, Adams writes of him that he 'loves his Ease, hates to offend, and seldom gives any opinion until obliged to do so.'"

Later in his life he writes of himself: "For my own part," he says, "everything of difficult discussion, and that requires close attention of mind and an application of long continuance, grows irksome to me, and where there is not some absolute necessity for it, as in the settlement of accounts, or the like, I am apt to indulge the indolence usually attending age, in postponing such business from time to time; though continually resolving to do it." For a time Franklin combatted this tendency, but soon again relapsed into his old habits.

In 1727 Franklin was taken down with his first illness, a pleurisy, which he tells us nearly carried him off. While convalescing he regretted "that I must now, sometime or other, have all that disagreeable work to do over."

In 1749 Franklin began to suffer from the gout, which troubled him at intervals during the remainder of his life. The attacks were at first not serious; and once for a period of five years he was free from attacks.

He wrote his wife from London, December 21, 1768: "Walking a great deal tires me less than it used to do. I feel stronger and more active. Yet I would not have you think that I fancy I shall grow young again. I know that according to the Course of Nature I cannot at most continue much longer, and that the living even of another Day is uncertain. I therefore now form no Schemes, but such as are of immediate Execution; indulging myself in no future Prospect except one, that of returning to Philadelphia, there to spend the Evening of Life with my Friends and Family." Again on June 10, 1760:

"On Friday came on a Fit of the Gout, from which I had been free Five Years. Immediately the Inflammation and Swelling in my throat disappeared; my foot swelled greatly, and I was confined about three Weeks; since which I am perfectly well, the Giddiness and every other disagreeable symptom having quite left me." Again on May 5, 1772:

"I thank you for your Advice about putting back a Fit of the

Gout. I shall never attempt such a Thing. Indeed, I have not much occasion to complain of the Gout, having had but two slight Fits since I came last to England."

Writing to General Washington from Philadelphia, on June 21, 1776, Franklin says: "I am just recovering from a severe Fit of the Gout which has kept me from Congress almost ever since you left us, so that I know little of what has pass'd there, except that a Declaration of Independence is preparing."

In Franklin's well-known dialogues between himself and the gout was a humorous note to Madame Brillon. There is much besides humor in the dialogue. It clearly indicates Franklin's appreciation of the conservative and corrective value of diseases. In spite of his suffering he was able to recognize that the pains of the gout were not an unmixed evil.

In 1779, while at the court of France, a serious seizure of gout interfered with his diplomatic duties.

Franklin's account of his treatment of the gout is worth quoting:

"I forgot to acquaint you," he told his friend, Dr. Small, "that I had treated it (my gout) a little cavalierly in its last accesses. Finding one night that my foot gave me more pain after it was covered warm in bed, I put it out of bed naked; and perceiving it easier, I let it remain longer than I had at first designed, and at length fell asleep, leaving it there till morning. The pain did not return, and I grew well. Next winter, having a second attack, I repeated the experiment; not with such immediate success in dismissing the gout, but constantly with the effect of rendering it less painful, so that it permitted me to sleep every night. I should mention that it was my son who gave me the first intimation of this practice. He being in the old opinion, that the gout was to be drawn out by transpiration; and having heard me say, that perspiration was carried on more copiously when the body was naked than when clothed, he put his foot out of bed to increase that discharge, and found ease by it, which he thought a confirmation of the doctrine. But this method requires to be confirmed by more experiments before one can conscientiously recommend it."

Franklin complained of his eyesight as early as 1755. In 1776 he devised a pair of spectacles for himself, each glass containing two lenses joined together by a horizontal line in the

center. The upper lense for distance and the lower one for near vision.

The following extracts from a letter written to his wife, dated London, Nov. 22, 1757, giving an account of his illness, his behavior as a patient, etc., are of interest:

"**MY DEAR CHILD:**

"During my illness, which continued near eight weeks, I wrote you several little letters, as I was able. The last was by the packet which sailed from Falmouth above a week since. In that I informed you, that my intermittent fever, which had continued to harass me, by frequent relapses, was gone off, and I had ever since been gathering strength and flesh. My doctor, Fothergill, who had forbid me the use of pen and ink, now permits me to write as much as I can without over-fatiguing myself, and therefore I sit down to write more fully than I have hitherto been able to do.

"The second of September I wrote to you that I had had a violent cold and something of a fever, but that it was almost gone. However, it was not long before I had another severe cold, which continued longer than the first, attended by great pain in my head, the top of which was very hot, and when the pain went off, very sore and tender. These fits of pain continued sometimes longer than at others; seldom less than 12 hours, and once 36 hours. I was now and then a little delirious: they cupped me on the back of the head, which seemed to ease me for the present; I took a great deal of bark, both in substance and infusion, and too soon thinking myself well, I ventured out twice, to do a little business and forward the service I am engaged in, and both times got fresh cold and fell again; my good doctor grew very angry with me for acting contrary to his cautions and directions, and obliged me to promise more observance for the future. He attended me very carefully and affectionately; and the good lady of the house nursed me kindly; Billy was also of great service to me, in going from place to place, where I could not go myself, and Peter was very diligent and attentive. I took so much bark in various ways that I began to abhor it; I durst not take a vomit, for fear of my head; but at last I was seized one morning with a vomiting and purging, the latter of which continued the greater part of the day, and I believe was a kind of crisis to the distemper, carrying it clear off; for ever since I feel quite lightsome, and am every day gathering strength; so

I hope my seasoning is over, and that I shall enjoy better health during the rest of my stay in England.

"It is now twelve days since I began to write this letter, and I still continue well, but have not yet quite recovered my strength, flesh, or spirits. I every day drink a glass of infusion of bark in wine, by way of prevention, and hope my fever will no more return; on fair days, which are but few, I venture out about noon. The agreeable conversation I meet with among men of learning, and the notice taken of me by persons of distinction, are the principal things that soothe me for the present, under this painful absence from my family and friends. Yet those would not keep me here another week, if I had not other inducements; duty to my country, and hopes of being able to do it service."

As is well known, Franklin suffered stone in the bladder for many years, which was very painful during the last few years of his life. It appears that he first became aware that he had a stone in 1783, when he was seventy-seven years of age. Concerning the stone he wrote to John Jay:

"It is true, as you have heard, that I have the stone, but not that I had thoughts of being cut for it. It is as yet very tolerable. It gives me no pain but when in a carriage on the pavement, or when I make some sudden quick movement. If I can prevent its growing larger, which I hope to do by abstemious living and gentle exercise; I can go on pretty comfortably with it to the end of my journey, which can now be at no great distance. I am cheerful, enjoy the company of my friends, sleep well, have sufficient appetite, and my stomach performs well its functions. The latter is very material to the preservation of health. I therefore take no drugs lest I should disorder it. You may judge that my disease is not very grievous, since I am more afraid of the medicines than the malady."

Franklin also suffered from a cutaneous affection of which he writes in several letters.

"To-morrow I set out with my friend, Dr. Pringle (Sir John), on a journey to Pyrmont, where he goes to drink the waters; but I hope more for the air and the exercise, having been used, as you know, to have a journey once a year, the want of which last year has, I believe, hurt me, so that, though I was not quite to say sick, I was often ailing last Winter, and through the Spring." He comments upon a skin affection with which he was

now troubled, noting that it appeared after eating freely of beef, and sometimes after a long confinement of writing with little exercise and which he was told was scorbutic. In 1773, he placed himself under the care of his good friend, Sir John Pringle, on account of a scab or scurf about the head. Sir John ordered a mercurial wash and a physic. Franklin states; "It slowly left that place, but appeared in other parts of my head." The physician also advised abstinence from salt meat and cheese, which advice Franklin "didn't much follow, often forgetting it."

He complained during his attendance upon Congress of frequent attacks of dizziness. He suffered also from a number of large boils about this time. In 1776, when seventy years of age, Franklin wrote from Paris where he had lately taken up his residence:

"I lived chiefly on salt beef, the fowls being too hard for my teeth. But, being poorly nourished, I was very weak at my arrival; boils continued to vex me, and the scurf extending over all the small of my back, on my sides, my legs, and my arms, besides what continued under my hair. I applied to a physician, who ordered me Mr. Bellosto's pills and an infusion of a root called —. I took the infusion a while, but it being disagreeable, and finding no effect, I omitted it. I continued to take the pills, but finding my teeth loosening, and that I had lost three, I desisted the use of them. I found that bathing stopped the progress of the disorder. I therefore took the hot bath twice a week, two hours at a time, till this last summer. It always made me feel comfortable, as I rubbed off the softened scurf in the warm water; and I otherwise enjoyed exceeding good health. I stated my case to Dr. Ingenhousz, and desired him to show it to Sir J. P., and obtain his advice. They sent me from London some medicine, but Dr. Ingenhousz proposing to come over soon, and the affair not pressing, I resolved to omit the medicine till his arrival."

It is interesting to note in this account that the loosening of the teeth of which Franklin complained, was probably due to salivation. Dr. Franklin's own efforts, with those of Dr. Ingenhousz and Sir John Pringle, to combat the disease are all matters of interest to physicians.

In 1779 Dr. Franklin wrote to a friend: "I can give you no good account. I have a long time been afflicted with almost constant and grievous pain, to combat which I have been obliged

to have recourse to opium, which indeed has afforded me some ease from time to time, but then it has taken away my appetite and so impeded my digestion that I am become totally emaciated, and little remains of me but a skeleton covered with a skin."

When an old man and reflecting on his past life and his bodily ailments, Franklin writes: "One means of becoming content with one's situation is the comparing it with a worse. Thus, when I consider how many terrible diseases the human body is liable to, I comfort myself that only three incurable ones have fallen to my share, viz.: the gout, the stone, and old age; and these have not yet deprived me of my natural cheerfulness, my delight in books, and my enjoyment of social conversation."

When the time arrived for him to leave France, in 1783, he was so infirm by reason of the gout and the stone that it became a question as to whether he could make the voyage. Marie Antoinette came to his rescue with an offer of a litter, carried by means of large mules. It was in this fashion that the great philosopher made his wonderful, triumphal march from Paris to the seaboard, where he embarked for home.

After his arrival in Philadelphia he had to be carried to the State House in a litter. He was a member of the Federal Convention. All his speeches were read by his colleague, Joseph Wilson, as Franklin was unable to stand on his feet.

In a letter to Dr. Ingenhousz, dated Philadelphia, October 24, 1788, Franklin writes:

"You have always been kind enough to interest yourself in what relates to my health. I ought therefore to acquaint you with what appears to me something curious respecting it. You may remember the cutaneous malady, I formerly complained of, and which you and Dr. Pringle favored me with prescriptions and advice. It vexed me near fourteen years, and was, the beginning of this year, as bad as ever, covering almost my whole body, except my face and hands; when a fit of the gout came on, without very much pain, but a swelling in both feet, which at last appeared also in both knees, and then in my hands. As these swellings increased and extended, the other malady diminished, and at length disappeared entirely. These swellings have sometimes since begun to fall, and are now almost gone; perhaps the cutaneous disease may return, or perhaps it is worn out. I may hereafter let you know what happens. I am on the whole much weaker than when it began to leave me. But possibly that may

be the effect of age, for I am now near eighty-three, the age of commencing decrepitude."

Dr. John Jones, his attending physician, has thus written of Franklin's last illness:

"The stone, with which he had been afflicted for several years, had for the last twelve months confined him chiefly to his bed; and during the extremely painful paroxysms he was obliged to take large doses of laudanum to mitigate his torture; still, in the intervals of pain, he not only amused himself with reading and conversing cheerfully with his family, and a few friends who visited him, but was often employed in doing business of a public as well as private nature, with various persons who waited on him for that purpose; and in every instance displayed not only that readiness and disposition of doing good which was the distinguishing characteristic of his life, but the fullest and clearest possession of his uncommon mental abilities; and not unfrequently indulged himself in those '*jeux d'esprit*' and entertaining anecdotes, which were the delight of all who heard him. About sixteen days before his death he was seized with a feverish indisposition, without any particular symptoms attending it, till the third or fourth day, when he complained of a pain in the left breast, which increased till it became extremely acute, attended with a cough and laborious breathing. During this state when the severity of his pain drew forth a groan of complaint, he would observe—that he was afraid he did not bear them as he ought—acknowledged his grateful sense of the many blessings he had received from that Supreme Being, who had raised him from small and low beginnings to such high rank and consideration among men—and made no doubt but his afflictions were kindly intended to wean him from a world in which he was no longer fit to act the part assigned him. In this frame of body and mind he continued till five days before his death, when his pain and difficulty of breathing entirely left him, and his family were flattering themselves with the hopes of his recovery, when an imposthume, which had formed itself in his lungs, suddenly burst and discharged a great quantity of matter, which he continued to throw up while he had sufficient strength to do it; but, as that failed, the organs of respiration became gradually oppressed—a calm lethargic state succeeded—and, on the 17th of April, 1790, about eleven o'clock at night, he quietly expired, closing a long and useful life of eighty-four years and three months."

Dr. Rush wrote to Dr. Price:

"The papers will inform you of the death of our late friend, Dr. Franklin. The evening of his life was marked by the same activity of his moral and intellectual powers which distinguished its meridian. His conversation with his family upon the subject of his dissolution was free and cheerful. A few days before he died, he rose from his bed and begged that it might be made up for him so *that he might die in a decent manner*. His daughter told him she hoped he would recover and live many years longer. He calmly replied, 'I hope not.' Upon being advised to change his position in bed, that he might breathe easy, he said, 'A dying man can do nothing easy.' All orders and bodies of people have vied with each other in paying tributes of respect to his memory."

FRANKLIN AS A MEDICAL BOOK PUBLISHER.

In days when but very few works on medicine were written in America, Franklin deserves mention as a medical book publisher of note. Among the works which he published or reprinted are the following:

In 1732 he reprinted a book originally published in London, dealing with "The Horror of the Gout," which set forth that the disease is "one of the greatest Blessings which can befall mortal man."

In 1734 he published a new edition of a book written by John Tennent entitled, "Every man his own Doctor; or the Poor Planter's Physician."

In 1741 Franklin printed the work of his friend, Dr. Cadwallader Colden, of New York, entitled "Essay on the Iliac Passion."

In 1751 he printed two medical essays, one by Dr. John Kearsley and the other, "Medicina Britannica," by Dr. Thomas Short.

In 1754 he wrote and printed a paper entitled "Some Account of the Pennsylvania Hospital—from its First Rise, the Beginning of the Fifth Month, called May, 1754," and which was circulated for the purpose of procuring subscriptions for the hospital.

SWIMMING AND BATHING.

Referring to his first visit to London when he worked there as a young apprentice, Franklin writes:

"At Watt's printing house I contracted an acquaintance with an ingenious young man, one Wygate, who, having

wealthy relations, had been better educated than most printers; was a tolerable Latinist, spoke French, and loved reading. I taught him and a friend of his to swim at twice going into the river, and they soon became good swimmers. They introduced me to some gentlemen from the country, who went to Chelsea by water to see the College and Don Saltero's curiosities. In our return, at the request of the company, whose curiosity Wygate had excited, I stripped and leaped into the river, and swam from near Chelsea to Blackfriar's, performing on the way many feats of activity, both upon and under the water, that surprised and pleased those to whom they were novelties.

"I had from a child ever delighted with this exercise, had studied and practised all Thevenot's motions and positions, added some of my own, aiming at the graceful and easy as well as the useful. All these I took this occasion of exhibiting to the company, and was much flattered by their admiration; and Wygate, who was desirous of becoming a master, grew more and more attached to me on that account, as well as from the similarity of our studies. He at length proposed to me traveling all over Europe together, supporting ourselves everywhere by working at our business. I was once inclined to it; but, mentioning it to my good friend, Mr. Denham, with whom I often spent an hour when I had leisure, he dissuaded me from it, advising me to think only of returning to Pennsylvania, which he was now about to do.

"On one of these days, I was, to my surprise, sent for by a great man I knew only by name, a Sir William Wyndham, and I waited upon him. He had heard by some means or other of my swimming from Chelsea to Blackfriar's, and of my teaching Wygate and another young man to swim in a few hours. He had two sons, about to set out on their travels; he wished to have them taught swimming, and proposed to gratify me handsomely if I would teach them. They were not yet come to town, and my stay was uncertain, so I could not undertake it; but from this incident I thought it likely that, if I were to remain in England and open a swimming school, I might get a good deal of money; and it struck me so strongly, that, had the overture been made sooner, probably I should not so soon have returned to America. After many years, you and I had something of more importance to do

with one of these sons of Sir William Wyndham, become Earl of Egremont, which I shall mention in its place."

In a most interesting letter to Dubourg written in 1773, Franklin discusses swimming, advocating it warmly, and expressing the opinion that it has the effect of "stopping diarrhea."

"The specific gravity of some human bodies, in comparison to that of water, had been examined by Mr. Robinson, in our *Philosophical Transactions*, Volume L, page 30, for the year 1757. He asserts, that fat persons with small bones float most easily upon the water.

"The diving-bell is accurately described in our *Transactions*. When I was a boy, I made two oval palettes, each about ten inches long and six broad, with a hole for the thumb, in order to retain it fast in the palm of my hand. They much resembled a painter's palette. In swimming I pushed the edges of these forward, and I struck the water with their flat surfaces as I drew them back. I remember I swam faster by means of these palettes, but they fatigued my wrists. I also fitted to the soles of my feet a kind of sandal; but I was not satisfied with them, because I observed that the stroke is partly given by the inside of the feet and the ankles, and not entirely with the soles of the feet.

"We have here waistcoats for swimming, which are made of double sail-cloth, with small pieces of cork quilted in between them.

"I know nothing of the scaphandre of M. de la Chapelle.

"I know by experience that it is a great comfort to a swimmer, who has a considerable distance to go, to turn himself sometimes on his back, and to vary in other respects the means of procuring a progressive motion.

"When he is seized with the cramp in the leg, the method of driving it away is, to give the parts affected a sudden, vigorous, and violent shock, which he may do in the air as he swims on his back.

"During the great heats of summer there is no danger in bathing, however warm we may be, in rivers which have been thoroughly warmed by the sun. But to throw one's self into cold water, when the body has been heated by exercise in the sun, is an imprudence which may prove fatal. I once knew an instance of four young men, who, having worked at

harvest in the heat of the day, with a view of refreshing themselves plunged into a spring of cold water; two died upon the spot, a third in the morning, and the fourth recovered with great difficulty. A copious draught of cold water, in similar circumstances, is frequently attended with the same effect in North America.

"The exercise of swimming is one of the most healthy and agreeable in the world. After having swam for an hour or two in the evening, one sleeps coolly the whole night, even during the most ardent heat of summer. Perhaps, the pores being cleansed, the insensible perspiration increases and occasions this coolness. It is certain that much swimming is the means of stopping a diarrhea, and even of producing a constipation. With respect to those who do not know how to swim or who are affected with a diarrhea at a season which does not permit them to use that exercise, a warm bath, by cleansing and purifying the skin, is found very salutary, and often effects a radical cure. I speak from my own experience, frequently repeated, and that of others, to whom I have recommended this."

In a letter to Oliver Neave which is rather too long to reproduce, Franklin urges that it is not too late in life for his friend to learn to swim; and then, in considerable detail he lays down rules for beginners in the art of swimming which would be of the greatest practical value were they, without alteration, posted up in swimming schools to-day.

Franklin argues on several occasions that in the case of scarcity of drinking water at sea, that the suffering from thirst may be in some measure relieved by immersing the body in water for some considerable period. In a letter to a young lady, 1769, he remarks:

"I take this Opportunity to send you, also, a late Paper, containing a melancholy Account of the Distresses of some Seamen. You will observe in it the Advantages they receiv'd from wearing their Clothes constantly wet with salt Water, under the total Want of fresh Water to drink. You may remember I recommended this Practice many years ago."

THE VALUE OF FRESH AIR AND PROPER VENTILATION.

The Nature and Contagiousness of "Colds."

Franklin was deeply impressed with the value of fresh air, at a time when it was far too much excluded from dwelling

houses, hospitals, and other public buildings. He thought upon and investigated the subject much and wrote upon it repeatedly. He devised and described the "Pennsylvania fire-place" which was intended to heat a room equally and secure an even temperature in it. Lord Kaimes, addressing him as a "universal smoke doctor," asked his advice as to the ventilation of his new house in Edinburgh. He was consulted as to the best methods of ventilation for the House of Commons; and several medical friends asked for suggestions for the ventilation of hospitals. Franklin often twitted his doctor friends on their fear of fresh air, or their tardy recognition of its value. The present open air treatment of tuberculosis patients may be fairly said to be nothing more than a concrete application of the principles for which Franklin stood. Franklin would not allow that fresh air was bad even when damp.

Parton remarks:

"He was among the first who called attention to the cruel folly of excluding fresh air from hospitals and sick rooms, particularly those of fever patients. Unquestionably he was the originator of the modern art of ventilation. He cleared the pure air of heaven from calumnious imputation, and threw open the windows to mankind."

In his investigations of the value of fresh air, Franklin gave much consideration to the subject of "colds," "catching colds," etc., and as will be presently seen, he set forth plainly and fully the modern theory of "colds" and the conditions under which they are contagious; and not until one hundred and fifty years later did these views of Franklin become those of the medical profession. They are now accepted everywhere.

Franklin's investigations in the subject of ventilation naturally led him to the careful consideration of and experiments upon chimneys. Smyth remarks:

"Before the time of Franklin's invention, smoky chimneys were among the commonest annoyances of domestic life. A smoky house is mentioned by Shakespeare in the category of tedious things with a tired horse and a railing wife. 'How may a smoky chimney be best cured?' was one of Franklin's queries for the Junto. 'It is strange methinks,' he remarked, 'that though chimneys have been for so long in use, the construction should be so little understood, till lately, that no workman pretended to make one which should always carry off all smoke.'"

The result of Franklin's studies was the invention of the "Pennsylvania fire-place," in 1742. Upon this subject he wrote a remarkable essay containing as it does many observations on physics, hygiene, ventilation, and public health. Several passages germane to this study will bear quoting.

While recognizing the improvement which had been made in the construction of chimneys by which the smoke had been eliminated, he observed that they are still quite objectionable because of the strong drafts at every crevice; and he goes on to say:

"Many colds are caught from this cause only; it being safer to sit in the open street, for then the Pores do all close together, and the Air does not strike so sharply against any particular Part. The Spaniards have a Proverbial Saying,

"If the Wind blows on you thro' a Hole,
Make your Will, and take care of your Soul."

Women particularly from this Cause, (as they sit much in the House) get Colds in the Head, Rheums, and Defluxions, which fall into their Jaws and Gums, and have destroyed early many a fine set of teeth in these Northern Colonies. Great and bright Fires do also very much contribute to damage the Eyes, dry and shrivel the Skin, and bring on early Appearances of Old-Age. In short, many of the Diseases proceeding from Colds, as Fevers, Pleurisies, etc., fatal to very great Numbers of people, may be ascribed to strongdrawing Chimneys, whereby, in severe Weather, a man is scorched before, while he's froze behind."

Continuing his argument for the advantages of the Pennsylvania fire-place devised by him, he makes the following observations: "That warm rooms make people tender and apt to catch cold, is a mistake as great as it is (among the *English*) general. We have seen in the preceding Pages how the common Rooms are apt to give Colds; but the writer of this Paper may affirm, from his own Experience, and that of his Family and Friends who have used warm Rooms, people are rendered *less liable* to take Cold, and indeed, *actually hardened*. If sitting warm in a Room made One subject to take cold on going out, lying warm in Bed should, by a Parity of Reason, produce the same effect when we rise. Yet we find we can leap out of the warmest Bed naked in the coldest morning, without any Danger; and in the same Manner out of warm Clothes into a cold bed. The Reason is, that in these Cases the Pores all close at once, the

Cold is shut out, and the Heat within augmented, as we soon after feel by the glowing of the flesh and skin. Thus no one was ever known to catch Cold by the use of the cold Bath: And are not cold Baths allowed to harden the Bodies of those that use them? Are they not therefore frequently prescribed to the tenderest Constitutions? Now, every Time you go out of a warm Room into a Cold Bath, and the effect is in proportion the same; for (tho' perhaps you may feel somewhat chilly at first) you find in a little Time your Bodies hardened and strengthened, your Blood is driven with a brisker Circulation, and a Comfortable, steady, uniform inward Warmth succeeds that equal outward Warmth you first received in the room. Farther to confirm this Assertion, we instance the *Swedes*, the *Danes*, the *Russians*; these Nations are said to live in Rooms, compared to ours, as hot as ovens; yet where are the hardy Soldiers, tho' bred in their boasted cool Houses, that can, like these People, bear the Fatigues of a Winter Campaign in so severe a Climate, march whole Days to the Neck in snow, and at Night entrench in Ice, as they do?" He sums up the advantages of the Pennsylvania fire-place under fifteen heads, of which the following are quoted:

"If you sit near the Fire, you have not that cold draft of uncomfortable Air nipping your Back and Heels, as when before common Fires, by which many catch Cold, being scorcht before, and as it were, froze behind.

"If you sit against a Crevice, there is not that sharp Draught of cold Air playing on you, as in Rooms where there are Fires in the common way; by which many catch cold whence proceed Coughs, Catarrhs, Tooth-aches, Fevers, Pleurisies, and many other Diseases.

"In Case of Sickness, they make most excellent Nursing-rooms; as they constantly supply a sufficiency of fresh air, so warmed at the same time as to be no way inconvenient or dangerous. A small One does well in a Chamber; and, the Chimney being fitted for it, it may be removed from one room to another, as Occasion requires, and fixed in half an Hour. The equal temper, too, and Warmth, of the Air of the Room, is thought to be particularly advantageous in some Distempers: For 'twas observed in the Winters of 1730 and 1736, when the small-pox spread in *Pennsylvania*, that very few of the Children of the Germans died of that Distemper in proportion to those of the *English*; which was ascribed by some to the warmth and equal

Temper of Air in their Stove-Rooms; which made the Disease as favorable as it commonly is in the *West Indies*. But this Conjecture we submit to the judgment of Physicians."

Writing on "The Causes and Cures of Smoky Chimneys," Franklin discusses, in some detail, the subject of ventilation, dampness, fresh air, colds, etc. "Some are as much afraid of fresh Air as persons in the Hydrophobia are of fresh water. I myself had formerly this prejudice, this Aerophobia, as I now account it; and, dreading the supposed dangerous Effects of cool Air, I considered it as an Enemy, and closed with extreme care every Crevice in the Rooms I inhabited.

"Experience has convinced me of my Error. I now look upon fresh Air as a friend; I even sleep with an open Window. I am persuaded, that no common Air from without is so unwholesome, as the Air within a close Room, that has been often breath'd and not changed. Moist Air, too, which formerly I thought pernicious, gives me no Apprehensions; for considering that no Dampness of Air apply'd to the Outside of my Skin can equal to what is apply'd to and touches it within, my whole Body being full of Moisture, and finding that I can lie two hours in a Bath twice a Week, covered with Water, which certainly is much damper than any Air can be, and this for Years together, without catching Cold, or being in any other manner disordered by it, I no longer dread mere Moisture, either in Air or in Sheets or Shirts: And I find it of no Importance to the Happiness of Life, the being freed from vain Terrors, especially of objects that we are every day exposed inevitably to meet with. You Physicians have of late happily discovered, after a contrary Opinion had prevail'd some Ages, that fresh and cool Air does good to Persons in the Small-Pox and other Fevers. It is to be hoped that in another Century or two we may all find out, that it is not bad even for People in Health. And as to Moist Air, here I am at this present Writing in a Ship with above 40 Persons, who have had no other but moist Air to breathe for 6 Weeks past; every thing we touch is damp, and nothing dries, yet we are all as healthy as we should be on the mountains of Switzerland, whose Inhabitants are not more than those of Bermuda or St. Helena Islands. Islands on whose Rocks the Waves are dashed into Millions of Particles which fill the Air with Damp, but produce no Distemper, the Moisture being pure, unmixed with the poisonous Vapours arising from Marshes and

stagnant Pools, in which many Insects die and corrupt the Water. These Places only, in my Opinion (which however I submit to yours), afford unwholesome Air; and that it is not the mere Water contained in Damp Air, but the volatile Particles of corrupted animal Matter mixed with that Water, which renders such Air Pernicious to those who breathe it. And I imagine it a Cause of the same kind that renders the Air in close Rooms, where the perspirable Matter is breathed over and over again by a number of assembled People, so hurtful to Health. After being in such a Situation, many find themselves affected by that *Febricula*, which the English alone call a *Cold*, and perhaps from the Name, imagine that they caught the malady by going out of the Room, when it was in fact by being in it."

Franklin's study of the subject of ventilation led him to make a number of interesting experiments, one of which is thus noted by Dr. Small, an English surgeon:

"The doctor confirmed this by this following experiment: He breathed gently through a tube into a deep glass mug, so as to impregnate all the air in the mug with this quality. He then put a lighted *bougie* into the mug, and upon touching the air therein the flame was instantly extinguished; by frequently repeating the operation, the *bougie* gradually preserved its light longer in the mug, so as in a short time to retain it to the bottom of it, the air having totally lost the bad quality it had contracted from the breath blown into it."

As has been remarked before, Franklin was on terms of intimate friendship with Joseph Priestley and they exchanged many letters and held many conferences together. Priestley performed some very interesting experiments, causing plants to grow in air which had become vitiated from human expiration. In a letter to Franklin, Priestley informs him of the very flourishing state of plants growing in this vitiated atmosphere. Replying to this letter Franklin writes:

"That the vegetable creation should restore the air which is spoiled by the animal part of it, looks like a rational system and seems to be a piece with the rest. Thus fire purifies water all the world over. It purifies it by distillation when it raises it in vapors and lets it fall in rain; and further still by filtration when, keeping it fluid, it suffers that rain to percolate the earth. We knew before that putrid animal substances were converted into sweet vegetables when mixed with the earth and applied as

manure; and now it seems that the same putrid substances, mixed with the air, have a similar effect. The strong thriving state of your mint, in the putrid air, seems to show that the air is mended by taking something from it and not by adding to it. I hope this will give some check to the rage of destroying trees that grow near houses, which has accompanied our late improvements in gardening, from an opinion of their being unwholesome. I am certain, from long observation, that there is nothing unhealthy in the air of the woods, and no people on earth enjoy better health or are more prolific."

Writing from London on July 28, 1768, to Dr. Dubourg, Franklin describes what he calls a fresh air bath.

"I greatly approve the epithet which you give, in your letter of the 8th of June, to the method of treating the small-pox, which you call the tonic or bracing method; I will take occasion from it to mention a practice to which I have accustomed myself. You know the cold bath has long been in vogue here as a tonic; but the shock of the cold water has always appeared to me, generally speaking, as too violent, and I have found it much more agreeable to my constitution to bathe in another element, I mean cold air. With this view I rise almost every morning and sit in my chamber without any clothes whatever, half an hour or an hour, according to the season, either reading or writing. This practice is not in the least painful but, on the contrary, agreeable; and if I return to bed afterwards before I dress myself, as sometimes happens, I make a supplement to my night's rest of one or two hours of the most pleasing sleep that can be imagined. I find no ill consequences whatever resulting from it and that at least it does not injure my health, if it does not in fact contribute much to its preservation. I shall therefore call it for the future a *bracing* or *tonic* bath."

In a letter to Dr. Hawkesworth, dated London, May 8, 1772, Franklin writes of Prisetley's experiments with Fix'd Air:

"Dr. Priestley discovered that two-fourths of the air, one produced by suffering dead mice to putrefy under glass, the other by the effervescence of chalk and water with a small quantity of acid or vitriol, in either of which living mice being put would instantly die, yet the two being mixed both become good common air, and mice breathe in it freely. From his own and Dr. McBride's Experiments (who thought Fix'd Air would prevent or cure the sea scurvy) he was persuaded it might be of use

in mortification. But of this there has been only a single experiment. A Physician of his acquaintance at Leeds wrote to him while he was lately in town that a person dying as was thought of a putrid fever with all the symptoms of a mortification in the bowels had been suddenly relieved and recovered by the injection of Fix'd Air as a clyster. These are all our present premises upon which you can judge as well as I how far one may expect the same Fix'd Air will be of service to a cancer, but, as you ask my opinion, as the case might be desperate and we know of no danger in the trial, I should be for trying it. I would first syringe the sore strongly with warm water impregnated with Fix'd Air so as to cleanse well the part. Then I would apply to it a succession of glasses filled with Fix'd Air, each glass to remain till the sore had absorbed the Fix'd Air contained in it. It would require a long description to explain the readiest methods of obtaining the air, applying it, and impregnating the water with it, and perhaps I would not make myself clearly understood."

In a letter to Jean Baptiste Le Roy, dated June 22, 1773, Franklin writes of his favorite subject, fresh air, as follows:

"I am pleased to hear you are engaged in the Consideration of Hospitals. I wish any Observations of mine could be of Use to you, they should be at your Service. But 'tis a Subject I am very little acquainted with. I can only say, that, if a free & copious Perspiration is of Use in Diseases, that seems, from the Experiments I mentioned to M. Dubourg, to be best obtained by light covering & fresh Air continually changing: The Moisture on the Skin when the Body is warmly covered, being a Deception and the Effect not of greater Transpiration, but of the Saturation of the Air included under the & in the Bed-clothes, which therefore can absorb no more, and so leaves it on the Body. From those Experiments I am convinced of what I indeed before suspected, that the Opinion of Perspiration being checked by Cold is an error, as well as that of Rheum being occasioned by Cold. But as this is Heresy here, and perhaps may be so with you, I only whisper it, and expect you will keep my Secret. Our Physicians have begun to discover that fresh Air is good for People in the Small-Pox and other Fevers, I hope they will find out that it does no harm to People in Health."

Two weeks later, writing to his old friend, Dubourg, he says:

"I have not time now to write what I intend upon the Cause of Colds, or Rheums, and my Opinions on that Head are so singular here, that I am almost afraid to hazard them abroad. In the meantime, be so kind as to tell me at your leisure, whether in France you have a general Belief that moist Air, and damp Shirts or Sheets, and wet Floors and Beds that have not lately been used, and Clothes that have not lately been worn, and going out of a warm Room into the Air, and leaving off a long-worn waistcoat, and wearing leaky Shoes, and sitting near an open Window, or Door, or in a Coach with both Glasses down, are all or any of them capable of giving the Distemper we call a Cold, and you a *Rheum* or *Catarrh*? Or are these merely *English* ideas?"

In another letter to Dr. Dubourg, Franklin offers some observations on the subject of perspiration, damp clothes, etc.

"I shall not attempt to explain why damp clothes occasion colds, rather than wet ones, because I doubt the fact; I imagine that neither the one nor the other contribute to this effect, and that the cause of colds are totally independent of wet and even cold. I propose writing a short paper on this subject the first moment of leisure I have at my disposal. In the mean time, I can only say that, having some suspicions that the common notion, which attributes to colds the property of stopping the pores and obstructing perspiration, was ill founded, I engaged a young physician, who is making some experiments with Sanctorius's balance, to estimate the different proportions of his perspiration, when remaining one hour naked, and another warmly clothed. He pursued the experiment in this alternate manner for eight hours successively and found his perspiration almost doubled during those hours in which he was naked."

Franklin's view of "colds" and their contagiousness and the advantage of fresh air are perhaps best set forth in a letter to Dr. Benjamin Rush, which he wrote from London June 14, 1773.

"I shall communicate your judicious remark, relating to the septic quality of the air transpired by patients in putrid diseases, to my friend, Dr. Priestley. I hope that after having discovered the benefit of fresh and cool air applied to the sick, people will begin to suspect that possibly it may do no harm to the well. I have not seen Dr. Cullen's book, but am glad to hear that he speaks of catarrhs or colds by contagion. I have long been satisfied from observation, that besides the general colds now

termed influenza (which may possibly spread by contagion, as well as by a particular quality of the air), people often catch cold from one another when shut up together in close rooms, coaches, &c., and when sitting near and conversing so as to breathe in each other's transpiration; the disorder being in a certain state. I think too, that it is the frouzy, corrupt air from animal substances, and the perspired matter from our bodies, which being long confined in beds not lately used, and clothes not lately worn, and books long shut up in close rooms, obtains that kind of putridity, which occasions the colds observed upon sleeping in, wearing, and turning over such bedclothes, or books, and not their coldness or dampness. From these causes, but more from too full living, with too little exercise, proceed in my opinion most of the disorders, which for one hundred and fifty years past the English have called *colds*.

"As to Dr. Cullen's cold or catarrh *a frigore*, I question whether such an one ever existed. Traveling in our severe winters, I have suffered cold sometimes to an extremity only short of freezing, but this did not make me *catch cold*. And, for moisture, I have been in the river two or three hours for a fortnight together, when one would suppose I might imbibe enough of it to *take cold* if humidity could give it; but no such effect ever followed. Boys never get cold by swimming. Nor are people at sea, or who live at Bermuda or St. Helena, small islands where the air must be moist from the dashing and breaking of waves against their rocks on all sides, more subject to colds than those who inhabit part of a continent where the air is driest. Dampness may indeed assist in producing putridity and those miasmata which infect us with the disorder we call a cold; but of itself can never by a little addition of moisture hurt a body filled with watery fluids from head to foot."

Writing to Thomas Percival, London, September 25, 1773, Franklin argues that "moist seasons" are healthiest, and again clearly sets forth his ideas as to the contagiousness of colds.

"'Tis a curious Remark that moist Seasons are the healthiest. The Gentry of England are remarkably afraid of Moisture, and of Air. But Seamen, who live in perpetually moist Air, are always Healthy, if they have good Provisions. The Inhabitants of Bermuda, St. Helena, and other Islands far

from Continents, surrounded with Rocks against which the Waves continually dashing fill the Air with Spray & Vapour, and where no Wind can arrive that does not pass over much Sea, and of course bring much Moisture, these People are remarkably healthy. And I have long thought that mere moist Air has no ill effect on the Constitution ; tho' Air impregnated with Vapour from putrid Marshes is found pernicious, not from the Moisture, but the Putridity. It seems strange that a Man whose Body is composed in great Part of Moist Fluids, whose Blood and Juices are so watery, who can swallow Quantities of Water and Small Beer daily without Inconvenience, should fancy that a little more or less Moisture in the Air should be of such Importance. But we abound in Absurdity and Inconsistency.

"Thus tho' it is generally allowed that *taking the Air* is a good Thing, yet what Caution against Air, what stopping of Crevices, what wrapping up in warm Clothes, what shutting of Doors and Windows! even in the midst of Summer! Many London Families go out once a day to take the Air; three or four Persons in a Coach, one perhaps sick; these go three or four Miles, or as many Turns in Hide Park, with the Glasses both up close, all breathing over & over again the same Air they brought out of town with them in the Coach with the least change possible, and rendered worse and worse every moment. And this they call *taking the Air*. From many Year's Observations on myself and others, I am persuaded we are on a wrong scent in supposing Moist or cold Air, the Cause of that Disorder we call *a Cold*. Some unknown Quality in the Air may perhaps produce colds, as in the influenza; but generally I apprehend they are the effect of too full Living in proportion to our Exercise."

Franklin's views on fresh air brought him on one occasion in active conflict with John Adams when the two were compelled to bunk together, in 1776. Adams, in his autobiography says:

"At Brunswick, but one bed could be procured for Dr. Franklin and me, in a chamber little larger than the bed, without a chimney, and with only one small window. The window was open, and I who was an invalid and afraid of the air of night, shut it close. 'Oh!' says Franklin, 'don't shut the window, we shall be suffocated.' I answered I was afraid of

the evening air. Dr. Franklin replied, 'The air within this chamber will soon be, and indeed is now, worse than that without doors. Come, open the window and come to bed, and I will convince you. I believe you are not acquainted with my theory of colds?' Opening the window, and leaping into bed, I said I had read his letters to Dr. Cooper, in which he had advanced, that nobody ever got cold by going into a cold church or any other cold air, but the theory was so little consistent with my experience, that I thought it a paradox. However, I had so much curiosity to hear his reasons that I would run the risk of a cold. The Dr. then began a harangue upon air and cold, and respiration and perspiration, with which I was so much amused that I soon fell asleep, and left him and his philosophy together, but I believe they were equally sound and insensible within a few minutes after me, for the last words I heard were pronounced as he was more than half asleep. I remember little of the lecture, except that the human body, by respiration and perspiration, destroy a gallon of air in a minute; that two such persons as were now in that chamber, would consume all the air in it in an hour or two; that by breathing over again the matter thrown off by the lungs and the skin, we should imbibe the real cause of colds, not from abroad, but from within."

ANATOMY AND PHYSIOLOGY.

In two letters to his friend, Dr. Cadwallader Colden, written in 1745, Franklin discusses the subject of absorption, perspiration, and circulation, at considerable length and after a most interesting fashion.

"I am extremely pleased with your doctrine of the *absorbent vessels* intermixed with the perspiratory ducts, both on the external and internal superficies of the body. After I had read Sanctorius, I imagined a constant stream of the perspirable matter issuing at *every* pore in the skin. But then I was puzzled to account for the effects of mercurial unctious for the strangury, sometimes occasioned by an outward application of the flies, and the like; since whatever virtue or quality might be in a medicine laid upon the skin, if it would enter the body, it must go against wind and tide, as one may say. Dr. Hales helped me a little, when he informed me, in his *Vegetable Statics*, that the body is not always in a perspirable,

but sometimes in an *imbibing state*, as he expresses it, and will at times actually grow heavier by being exposed to moist air. But this did not quite remove my difficulty; since, as these fits of imbibing did not appear to be regular or frequent, a blistering plaster might lie on the body a week, or a mercurial ungent be used a month, to no purpose, if the body should so long continue in a perspirable state. Your doctrine, which was quite new to me makes all easy: since the body may perspire, and absorb at the same time, through the different ducts destined to those different ends.

"I must own, however, that I have one objection to the explanation you give of the operation of these absorbents. That they should communicate with the veins, and the perspirants with the arteries only, seems natural enough; but, as all fluids by the hydrostatical law pass equally in all directions, I question whether the *mere direction* of one of those minute vessels, where it joins with the vein or artery, *with* or *against* the stream of blood in the larger vessel, would be sufficient to produce such contrary effects as *perspiring* and absorbing. If it would, perspirants and absorbents might proceed from the arteries only, or from the veins only, or

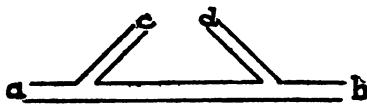


FIG. 1.

from both indifferently; as, by the figure in the margin (Fig. 1) whether the vessel a b is an artery or a vein, if the stream moves from a to b, the minute communicating vessel c shall be a perspirant, and d an absorbent; and the contrary, if it moves from b to a. Yet I can not say I am certain the mere direction of the vessel will have no effect; I only suspect it, and am making a little machine to try an experiment with for satisfaction.

"It is a siphon made of two large joints of Carolina cane united at e, into which two small glass tubes, f and g, are to be inserted, one on the descending, and the other on the ascending side. (See Fig. 2.) I propose to fill the siphon and the two glass tubes with water, and, when it is playing, unstop at the same instant the tops of both glass tubes,

observing in which the water sinks fastest. You shall know the success. I conceive the pressure of the atmosphere on the apertures of the two glass tubes to be no way different from the pressure of the same on the mouths of the perspirants and absorbents, and if the water sinks equally in the tubes, notwithstanding the direction of one against the other with the stream, I shall be ready to think we must look out for another solution. You will say, perhaps, that it will then be time enough when the experiment is tried, and succeeds as I suspect, yet I can not forbear attempting at one beforehand, while some thoughts are present in my mind. If a new solution should be found necessary, this may be ready for consideration.

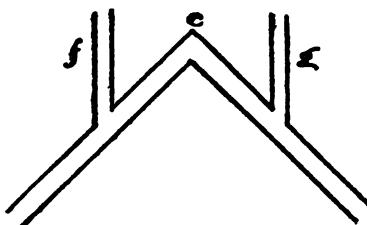


FIG. 2.

"I do not remember, that any antagonist, that has fallen in my way, has assigned any other cause of the motion of the blood through its whole circle, than the contractile force of the heart, by which that fluid is driven with violence into the arteries, and so continually propelled by repetitions of the same force, till it arrives at the heart again. May we for our present purpose suppose another cause producing half the effect, and say that the ventricles of the heart, like syringes, *draw*, when they dilate, as well as force when they contract? That this is not unlikely, may be judged from the valves nature has placed in the arteries, to prevent the drawing back of the blood in those vessels when the heart dilates, while no such obstacles prevent its sucking (to use the vulgar expression) from the veins. If this be allowed, and the insertion of the absorbents into the veins and of the perspirants into the arteries be agreed to, it will be of no importance in what direction they are inserted. For, as the branches of the arteries are continually lessening in their diameters, and the motion of the blood decreasing by means of the increased

resistance, there must, as more is constantly pressed on behind, arise a kind of *crowding* in the extremities of those vessels, which will naturally *force out* what is contained in the perspirants that communicate with them. This lessens the quality of blood, so that the heart can not receive again by the veins all it had discharged into the arteries, which occasions it to draw strongly upon the absorbents that communicate with them. And thus the body is continually perspiring and imbibing. Hence after long fasting the body is more liable to receive infection from bad air, and food, before it is sufficiently chylified, is drawn crude into the blood by absorbents that open into the bowels.

"To confirm this position, that the heart *draws*, as well as *drives* the blood, let me add this particular. If you sit or lean long, in such a manner as to compress the principle artery that supplies a limb with blood, so that it does not furnish a due quantity, you will be sensible of a pricking pain in the extremities like that of a thousand needles; and the veins, which used to raise your skin in ridges, will be (with the skin) sunk into channels; the blood being drawn out of them, and their sides pressed so closely together that it is with difficulty and slowly that the blood afterwards enters them, when the compressed artery is relieved. If the blood was not drawn by the heart, the compression of an artery would not empty a vein, and I conjecture that the pricking pain is occasioned by the sides of the small vessels being pressed together.

"If there is no contrivance in the frame of the auricles or ventricles of the heart, by which they dilate themselves, I can not conceive how they are dilated. It is said, by the force of the venal blood rushing into them. But if that blood has no force which was not first given to it by the contraction of the heart, how can it (diminished as it must be by the resisting friction of the vessels it has passed through) be strong enough to overcome that contraction? Your doctrine of fermentation in the capillaries helps me a little; for if the returning blood be rarefied by the fermentation, its motion must be increased; but as it seems to me that it must by its expansion resist the arterial blood behind it, as much as it accelerates the venal blood before it, I am still somewhat unsatisfied. I have heard or read somewhere, too, that the

hearts of some animals continue to contract and dilate, or to beat, as it is commonly expressed, after they are separated from the other vessels, and taken out of the body. If this be true, their dilation is not caused by the force of the returning blood.

"I should be glad to satisfy myself, too, whether the blood is always quicker in motion, when the pulse beats quicker. Perhaps more blood is driven forward by one strong, deep stroke, than by two that are weak and light; as a man may breathe more by one long common respiration, when in health, than by two quick, short ones in a fever. I applied the siphon I mentioned to you in a former letter to a pipe of a water-engine. E is the engine; a, its pipe, bbb, the siphon; c and d, the two glass pipes communicating with the siphon (Fig. 3).

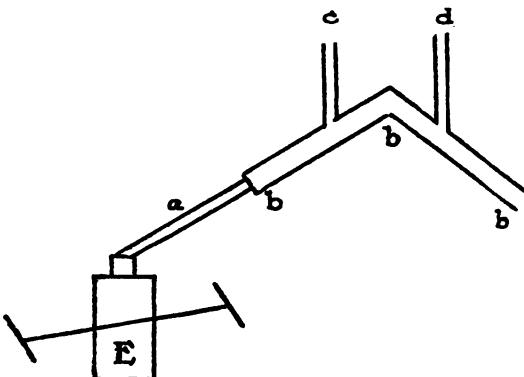


FIG. 3.

Upon working the engine, the water flowed through the siphon, and the glass tube c; but none was discharged through d. When I stopped with my finger the end of the siphon, the water issued at both glass tubes, with equal force, and on only half stopping the end of the siphon, it did the same. I imagine the sudden bending of the siphon gives such a resistance to the stream, as to occasion its issuing out of the glass tube c. But I intend to try a further experiment, of which I shall give you an account."

In another piece, of unknown date, under the title of "A Conjecture As To The Cause Of The Heat Of The Blood In Health, And Of The Cold And Hot Fits Of Some Fevers," Franklin continues his discussion of the subject of anatomy and physiology:

"The parts of fluids are so smooth, and roll among one another with so little friction, that they will not by any (mechanical) agitation grow warmer. A phial half full of water shook with violence and long continued, the water neither heats itself nor warms the phial. Therefore the blood does not acquire its heat either from the motion and friction of its own parts, or its friction against the sides of its vessels.

"But the parts of solids, by reason of their closer adhesions can not move among themselves without friction, and that produces heat. Thus, bend a plummet to and fro, and, in the place of bending, it shall soon grow hot. Friction on any part of our flesh heats it. Clapping of the hands warms them. Exercise warms the whole body.

"The heart is a thick muscle, continually contracting and dilating near eighty times a minute. By this motion there must be a constant interfriction of its constituent solid parts. That friction must produce a heat, and that heat must consequently be continually communicated to the perfluent blood.

"To this may be added, that every propulsion of the blood by the contraction of the heart, distends the arteries, which contract again in the intermission and this distension and contraction of the arteries may occasion heat in them, which they likewise communicate to the blood that flows through them.

"That these causes of the heat of the blood are sufficient to produce the effect, may appear probable, if we consider that a fluid once warm requires no more heat to be applied to it in any part of time to keep it warm, than what it shall lose in an equal part of time. A smaller force will keep a pendulum going, than what first set it in motion.

"The blood, thus warmed in the heart, carries warmth with it to the very extremities of the body, and communicates it to them; but as by this means its heat is gradually diminished, it is returned again to the heart by the veins for a fresh calefaction.

"The blood communicates its heat, not only to the solids of our body, but to our clothes, and to a portion of the circumambient air. Every breath, though drawn in cold, is expired warm; and every particle of the *materia perspirabilis* carries off with it a portion of heat.

"While the blood retains a due fluidity, it passes freely through the minutest vessels, and communicates a proper

warmth to the extremities of the body. But when by any means it becomes viscid, as not to be capable of passing those minute vessels, the extremities, as the blood can bring no more heat to them, grow cold.

"The same viscosity in the blood and juices checks or stops the perspiration, by clogging the perspiratory ducts, or, perhaps, by not admitting the perspirable parts to separate. Paper wet with size and water will not dry so soon as if wet with water only.

"A vessel of hot water, if the vapor can freely pass from it, soon cools. If there be just fire enough under it to add continually the heat it loses, it retains the same degree. If the vessel be closed so that the heat may be retained, there will from the same fire be a continual accession of heat to the water, till it rises to a great degree. Or, if no fire be under it, it will retain the heat it first had for a long time. I have experienced, that a bottle of hot water stopped, and put in my bed at night, has retained so much heat seven or eight hours, that I could not in the morning bear my foot against it, without some of the bedclothes intervening.

"During the cold fit, then, perspiration being stopped, a great part of the heat of the blood, that used to be dissipated, is confined and retained in the body; the heart continues its motion, and creates a constant accession to that heat; the inward parts grow very hot, and, by contact with the extremities, communicate that heat to them. The glue of the blood is by this heat dissolved, and the blood afterwards flows freely, as before the disorder."

On one occasion he wrote to his friend, Dr. Ingenhouz: "To inquisitive minds like yours and mine the reflection that the quantity of human knowledge bears no proportion to the quantity of human ignorance must be in one view rather pleasing, *viz.*, that though we are to live forever we may be continually amused and delighted with learning something new." He discussed with Dubourg the question of life and death. He related to his friend that on one occasion he had received a bottle of Madeira from America; and that upon opening it three flies fell into the first glass that was filled. He goes on to say: "Having heard it remarked that drowned flies were capable of being revived by the rays of the sun, I proposed making an experiment upon these; they were therefore ex-

posed to the sun upon a sieve which had been employed to strain them out of the wine. In less than three hours two of them began by degrees to recover life. They commenced by some convulsive motions of the thighs, and at length they raised themselves upon their legs, wiped their eyes with their forefeet, beat and brushed their wings with their hind feet, and soon after began to fly, finding themselves in Old England, without knowing how they came thither. The third continued lifeless till sunset, when, losing all hopes of him, he was thrown away.

"I wish it were possible, from this instance, to invent a method of embalming drowned persons, in such a manner that they may be recalled to life at any period, however distant; for having a very ardent desire to see and observe the state of America a hundred years hence, I should prefer to any ordinary death, the being immersed in a cask of Maderia wine, with a few friends, till that time, to be then recalled to life by the solar warmth of my dear country."

Commenting on the above Smyth remarked: "Had his eyes opened after a century's slumber, upon what a world would their calm gaze have rested! The vast images that he saw in glimmering dawn become now the commonplaces of school boys. His daring prophecies of the possibilities of electricity more than fulfilled. A great and proud people, justifying his unfaltering faith in popular instincts and institutions, holding in grateful and perpetual memory his lifelong labours and sacrifices!"

BI-FOCAL SPECTACLES.

For the invention of the bi-focal glass we are indebted to Franklin. When Dollond, the celebrated optician, learned of Franklin's invention, he supposed that the device would be suitable only for particular eyes. Writing to Whatley on this subject Franklin observes:

"By Mr. Dollond's saying that my double spectacles can only serve particular eyes, I doubt he has not been rightly informed of their construction. I imagine it will be found pretty generally true, that the same convexity of glass through which a man sees clearest and best at the distance proper for reading is not the best for greater distances. I therefore had formerly two pair of spectacles which I shifted occasionally, as in

travelling I sometimes read, and often wanted to regard the prospects. Finding this change troublesome, and not always sufficiently ready, I had the glasses cut and half of each kind associated in the same circle. By this means as I wear my spectacles constantly, I have only to move my eyes up or down, as I want to see distinctly far or near, the proper glass being always ready. This I find more particularly convenient since my being in France, the glasses that serve me best at table to see what I eat, not being the best to see the faces of those on the other side of the table who speak to me; and when one's ears are not well accustomed to the sounds of a language, a sight of the movements in the features of him that speaks helps to explain; so that I understand French better by the help of my spectacles."

A FLEXIBLE CATHETER.

The following letter, by Franklin, in the possession of Dr. F. N. Otis, of New York, on the subject of flexible catheters, is of peculiar interest for the physician:

"DEAR BROTHER: Reflecting yesterday on your desire to have a flexible catheter, a thought struck into my mind, how one might probably be made; and lest you should not readily conceive it by any description of mine, I went immediately to the silver-smith's and gave directions for making one (sitting by till it was finished) that it might be ready for this post. But now it is done I have some apprehensions that it may be too large to be easy; if so a silver-smith can easily make it less by twisting or turning it on a smaller wire, and putting a smaller pipe to the end, if the pipe is really necessary. This machine may either be covered with small fine gut, first cleaned and soaked a night in a solution of alum and salt and water, then rubbed dry, which will preserve it longer from putrefaction; then wet again and drawn on and tied to the pipes at each end, where little hollows are made for the thread to bind in and the surface greased. Or perhaps it may be used without the gut, having only a little tallow rubbed over it, to smooth it and fill the joints. I think it is as flexible as would be expected in a thing of the kind, and I imagine will readily comply with the turns of the passage, yet has stiffness enough to be protruded; if not, the enclosed wire may be used to stiffen the hinder part of the pipe while the fore part is pushed forward, and as it proceeds the wire may be gradually withdrawn. The tube is of such a nature, that when you have occasion to with-

draw it its diameter will lessen, whereby it will move more easily. It is a kind of screw and may be both withdrawn and introduced by turning. Experience is necessary for the right using of all new tools or instruments, and that will perhaps suggest some improvement to this instrument as well as better direct the manner of using it."

POKE-WEED IN THE TREATMENT OF CANCER.

To Dr. Cadwallader Colden, Franklin wrote on April 23, 1752:

"I am heartily glad to hear more instances of the success of the Poke-weed, in the Cure of that horrible Evil to the human Body, a Cancer. You will deserve highly of Mankind for the Communication. But I find in Boston they are at a loss to know the right Plant, some asserting it is what they call *michoacan*, others other Things. In one of their late Papers it is publickly requested, that a perfect Description may be given of the Plant, its Places of Growth, etc. I have mislaid the Paper, or would send it to you. I tho't you had described it pretty fully. With great Respect and Esteem, etc.

B. FRANKLIN."

In a letter to Dr. Dubourg, dated March 27, 1773, Franklin writes:

"I apprehend that our poke-weed is what botanists term *phytolacca*. This plant bears berries as large as peas; the skin is black, but it contains a crimson juice. It is this juice, thickened by evaporation in the sun, which was employed. It caused great pain, but some persons were said to have been cured. I am not quite certain of the facts; all that I know is, that Dr. Colden had a good opinion of the remedy."

STATIC ELECTRICITY AS A REMEDY FOR THE RELIEF OF PARALYSIS.

Franklin wrote a most interesting letter to his old friend, Sir John Pringle, on this subject, from which the physician may draw several important lessons:

"SIR—In compliance with your request, I send you the following account of what I can recollect relating to the effects of electricity in paralytic cases, which have fallen under my observation.

"Some years since, when the newspapers made mention of great cures performed in *Italy* and *Germany*, by means of electricity, a number of paralytics were brought to me from differ-

ent parts of Pennsylvania, and the neighboring provinces, to be electrified, which I did for them at their request. My method was, to place the patient first in a chair, on an electric stool, and draw a number of strong sparks from all parts of the affected limb or side. Then I fully charged two six gallon glass jars, each of which had about three square feet of surface coated; and I sent the united shock of these through the affected limb or limbs, repeating the stroke commonly three times each day. The first thing observed, was an immediate greater sensible warmth in the lame limbs that had received the stroke, than in the others; and the next morning the patients usually related that they had in the night felt a pricking sensation in the flesh of the paralytic limbs; and would sometimes shew a number of small red spots, which they supposed were occasioned by those prickings. The limbs, too, were found more capable of voluntary motion and seemed to receive strength. A man, for instance, who could not the first day lift the lame hand from off his knee, would the next day raise it four or five inches, the third day higher; and on the fifth day was able, but with a feeble languid motion, to take off his hat. These appearance gave great spirits to the patients, and made them hope a perfect cure; but I do not remember that I ever saw any amendment after the fifth day; which the patients perceiving, and finding the shock pretty severe, they became discouraged, went home, and in a short time relapsed; so that I never knew any advantage from electricity in palsies that was permanent. And how far the apparent temporary advantage might arise from the exercise in the patient's journey, and coming daily to my house, or from the spirits given by the hope of success, enabling them to exert more strength in moving their limbs, I will not pretend to say.

"Perhaps some permanent advantage might have been obtained, if the electric shocks had been accompanied with proper medicine and regimen, under the direction of a skillful physician. It may be, too, that a few great strokes, as given in my method, may not be so proper as many small ones; since, by the account from *Scotland* of a case, in which two hundred shocks from a phial were given daily, it seems that a permanent cure has been made. As to any uncommon strength supposed to be in the machine used in that case, I imagine it could have no share in the effect produced; since the strength of the shock from charged glass is in proportion to the quantity of surface

of glass coated; so that my shocks from those large jars must have been much greater than any that could be received from a phial held in the hand. I am, with great respect, Sir,

"Your most obedient servant,
"B. FRANKLIN."

How many physicians of the present day employing a new or novel remedy observe the caution shown by Franklin in this letter? The "spirit given by the hope of success" if recognized by physicians as well as it was by Franklin would save us from many therapeutic follies. The calm, judicious manner in which Franklin gives his account of these electric experiments might well serve as an admirable pattern for the medical essayist of to-day.

INOCULATION AGAINST SMALL-POX.

Franklin took a very deep and personal interest in the subject of inoculation against small-pox. In his autobiography he wrote: "In 1736 I lost one of my sons, a fine boy of four years old, by the small-pox, taken in the common way. I long regretted bitterly, and still regret that I had not given it to him by inoculation. This I mention for the sake of parents who omit that operation, on the supposition that they should never forgive themselves if a child died under it; my example showing that the regret may be the same either way, and that, therefore, the safer should be chosen."

Soon after the death of his child Franklin caused to be printed in the *Pennsylvania Gazette* the following notice:

"Understanding 'tis a current report, that my son Francis, who died lately of the small-pox, had it by inoculation; and being desired to satisfy the publick in that particular; inasmuch as some people are, by that report (join'd with others of like kind, and perhaps equally groundless) deter'd from having that operation perform'd on their children, I do hereby sincerely declare, that he was not inoculated, but receiv'd the distemper in the common way of infection; and I suppose the report could only arise from its being my known opinion, that inoculation was a safe and beneficial practice; and from my having said among my acquaintance, that I intended to have my child inoculated, as soon as he should have recovered sufficient strength from a flux with which he had been long afflicted.

B. FRANKLIN."

Many years later, while ambassador at the court of France, in a pathetic chord he wrote to Franklin Bache from Passy of the small-pox, to which four school children had succumbed, remarking: "How happy it is for you that your Parents took care to have you inoculated when you were an infant."

In a letter written to John Perkins in 1752, Franklin argues strongly for the efficacy of inoculation, quoting the favorable experience of American physicians with the method. Concluding his letter, he says: "I have a French piece printed at Paris, 1724, entitled, *Observations sur la Saignee du pied, et sur la Purgation, um commencement de la Petite Verole, et Paisons de double contre l' Inoculation*. A letter of the doctor's is mentioned in it. If he or you have it not, and desire to see it, I will send it. Please to favor me with the particulars of your purging method, to prevent the secondary fever."

In this place we must consider Franklin's interest in the subject of inoculation against small-pox somewhat at length.

It is to Lady Mary Montague that we owe the introduction of the practice of inoculation against small-pox into Europe. In a letter dated, Adrianople, April 1, 1717, O.S., she wrote: "The Small-pox so fatal and general amongst us is here entirely harmless by the invention of ingrafting, which is the term they give it. There is a set of old women who make it their business to perform the operation every autumn when the heat is abated. People send to one another to know if any of their family has a mind to have the small-pox; they make parties for the purpose; and when they are met (commonly fifteen or sixteen together), the old woman comes with a nut shell of the matter of the best small-pox."

Soon after writing this letter Lady Mary's three-year-old son was inoculated by Mr. Maitland, surgeon to the British Ambassador (her husband) at the Ottoman court.

Lady Mary with her husband and children returned to England in 1718; and in 1721 her little daughter, who had been born in Turkey, was inoculated in London by Mr. Maitland. This was the first inoculation made in Europe outside of Turkey.

The scholarly clergyman, Cotton Mather, through the *Transactions of the Royal Society*, learned of the theory and practice of inoculation and became greatly interested in it; and at his instigation 285 persons were inoculated in Boston in 1721, by Dr. Zabdiel Boylston. Only one of those inoculated died. But

inoculation raised a great deal of opposition, which was for a time so violent that Dr. Boylston and Cotton Mather were both in danger of their lives. To the shame of our profession, it must be recorded that Dr. Boylston was opposed not only by the laity, but by every other physician in Boston. At the time, Benjamin Franklin was an apprentice boy in Boston, working for his brother James.

This opposition to the practice of inoculation which developed on its introduction, continued throughout several succeeding decades.

In 1759 a joint pamphlet was published by Benjamin Franklin and Dr. William Heberden, of London, the object of which was to diffuse in the colonies a correct understanding of inoculation and its advantages. Dr. Heberden's part of the pamphlet consisted in, "Plain instructions for inoculation in the small-pox, by which any person may be enabled to perform the operation, and conduct the patient through the distemper." The pamphlet was entitled:

"Some account of the success of inoculation for the small-pox in England and America. Together with plain instructions, by which any person may be enabled to perform the operation, and conduct the patient through the distemper."

Franklin's contribution to this joint production was as follows:

"London, Feb. 16, 1759.

"Having been desired by my greatly esteemed friend, Dr. William Heberden, F.R.S., one of the principal physicians of this city, to communicate what account I had of the success of Inoculation in Boston, New England, I some time since wrote and sent to him the following paper, *viz.*:

"About 1753 or 1754, the small-pox made its appearance in Boston, New England. It had not spread in the town for many years before, so that there were a great number of the inhabitants to have it. At first, endeavours were used to prevent its spreading, by removing the sick, or guarding the houses in which they were; and with the same view Inoculation was forbidden; but when it was found that these endeavors were fruitless, the distemper breaking out in different quarters of the town, and increasing, Inoculation was then permitted.

"Upon this, all that inclined to Inoculation for themselves or families hurried into it precipitately, fearing the infection might

otherwise be taken in the common way; the number inoculated in every neighborhood spread the infection likewise more speedily among those who did not choose Inoculation; so that in a few months the distemper went thro' the town, and was extinct; and the trade of the town suffered only a short interruption, compar'd with what had been usual in former times, the country people during the seasons of that sickness fearing all intercourse with the town.

"As the practice of Inoculation always divided people into parties, some contending warmly for it, and others as strongly against it; the latter asserting that the advantages pretended were imaginary, and that the Surgeons, from views of interest, conceal'd or diminished the true number of deaths occasion'd by Inoculation, and magnify'd the number of those who died of the Small-pox in the common way: It was resolved by the Magistrate of the town, to cause a strict and impartial enquiry to be made by the Constables of each ward, who were to give in their returns upon oath; and that the enquiry might be more strictly and impartially, some of the partisans for and against the practice were join'd as assistants to the officers, and accompany'd them in their progress through the wards from house to house. Their several returns being received, and summed up together, the number turn'd out as follows:

<i>Had the Small-pox in the Common way.</i>	<i>Of these Died.</i>	<i>Received the Distemper by Inoculation.</i>	<i>Of these Died.</i>
Whites. Blacks.	Whites. Blacks.	Whites. Blacks.	Whites. Blacks.

Whites.	Blacks.	Whites.	Blacks.	Whites.	Blacks.	Whites.	Blacks.
5,059	485	452	62	1,974	139	23	7

"It appeared by this account that the deaths of persons inoculated, were more in proportion at this time than had been formerly observed, being something more than one in a hundred. The favourers of Inoculation however would not allow that this was owing to any error in the former accounts, but rather to the Inoculating at this time many unfit subjects, partly through the impatience of people who would not wait the necessary preparation, lest they should take it in the common way; and partly from the importunity of parents prevailing with the Surgeons against their judgment and advice to inoculate weak children, labouring under other disorders; because the parents could not immediately remove them out of the way of the

distemper, and thought they would at least stand a better chance by being inoculated than in taking the infection as they would probably do, in the common way.

"The Surgeons and Physicians were also suddenly oppressed with the great hurry of business, which so hasty and general an Inoculation and spreading of the distemper in the common way must occasion, and probably could not so particularly attend to the circumstances of the patients offered for Inoculation.

"Inoculation was first practised by Dr. Boylston in 1720. It was not used before in any part of America, and not in Philadelphia till 1730. Some years since, an enquiry was made in Philadelphia of the several Surgeons and Physicians who had practis'd Inoculation, what numbers had been by each inoculated, and what was the success. The result of this enquiry was that upwards of 800 (I forget the exact number) had been inoculated at different times, and that only four of them had died. If this account was true, as I believe it was, the reason of greater success then than had been found in Boston, where the general loss by Inoculation used to be estimated at about one in 100, may probably be from this circumstance; that in Boston they always keep the distemper out as long as they can, so that when it comes, it finds a greater number of adult subjects than in Philadelphia, where since 1730 it has gone thro' the town once in four or five years, so that the greatest number of subjects for Inoculation must be under that age.

"Notwithstanding the now uncontroverted success of Inoculation it does not seem to make that progress among the common people in America, which at first was expected. Scruples of conscience weigh with many concerning the lawfulness of the practice: And if one parent or near relation is against it, the other does not chuse to inoculate a child without free consent of all parties, lest in case of a disastrous event, perpetual blame should follow.

"These scruples a sensible Clergy may in time remove. The expense of having the operation performed by a Surgeon weighs with others, for that has been pretty high in some parts of America; and when a common tradesman or artificer has a number in his family to have the distemper, it amounts to more money than he can well spare. Many of these, rather than own the true motive for declining Inoculation, join with the scrupulous in the cry against it, and influence others. A small pamphlet

wrote in plain language by some skillful Physician, and published directing what preparations of the body should be used before the Inoculation of children, what precautions to avoid giving the infection at the same time in the common way, and how the operation is to be performed, the incisions dressed, the patient treated, and on the appearance of what symptoms a Physician is to be called, etc., might by encouraging parents to inoculate their own children, be a means of removing that objection of the expense, render the practice much more general, and thereby save the lives of thousands.

"The Doctor, after perusing and considering the above, humanely took the trouble (tho' his extensive practice affords him scarce any time to spare) of writing the following Plain Introductions, and generously at his own private expense, printed a very large impression of them, which was put into my hands to be distributed gratis in America. Not aiming at the prize which however is justly due to such disinterested benevolence, he has omitted his name; but as I thought the advice of a nameless Physician might possibly on that account be less regarded I have, without his knowledge, here divulged it. And I have prefixed to his small but valuable work these pages, containing the facts that have given rise to it, because facts generally have, as indeed they ought to have, great weight in persuading to the practice they favour. To these I may also add an account I have been favoured with by Dr. Archer, physician to the Small-pox Hospital here, *viz.*:

Persons.

There have been inoculated in this Hospital since its first institution to this day, December 31, 1758.....	1,601
Of which number died	6
Patients who had the Small-pox in the common way in this Hospital, to the same day.....	3,856
Of which number have died.....	1,002

"By this account it appears, that in the way of inoculation there has but one patient died in 267, whereas in the common way there has died more than one in four. The mortality indeed in the latter case appears to have been greater than usual (one in seven, when the distemper is not very favourable, being reckoned the common loss in towns by the Small-pox, all ages and ranks taken together) but these patients were mostly adults, and were received, it is said, into the Hospital after great

irregularities had been committed. By the Boston account it appears that, Whites and Blacks taken together, but about one in eleven died in the common way, and the distemper then was therefore reckoned uncommonly favourable. I have also obtained from the Foundling Hospital (where all the children admitted, that had not had the Small-pox, are inoculated at the age five years) an account to this time of the success of that practice there, which stands thus, *viz.:*

Inoculated, boys 162, girls 176, in all.....	338
Of these died in Inoculation, only.....	2

"And the death of one of these two was occasioned by a worm fever. On the whole, if the chance was only as two to one in favour of the practice among children, would it not be sufficient to induce a tender parent to lay hold of the advantages?

"But when it is so much greater, as it appears to be by these accounts (in some even as thirty to one) surely parents will no longer refuse to accept and thankfully use a discovery God in his mercy has been pleased to bless mankind with: whereby some check may now be put to the ravages that cruel disease has been accustomed to make, and the human species be again suffered to increase as it did before Small-pox made its appearance. This increase has indeed been more obstructed by that distemper than is usually imagined: For the loss of one in ten thereby is not merely the loss of so many persons, but the accumulated loss of all the children's children the deceased might have had, multiplied by successive generations.

"B. FRANKLIN, of Philadelphia."

LEAD POISONING.

Franklin's observations on colica Pictonum or "dry bellyache" are of the highest scientific value. John Hunter in his paper on the same subject quotes Franklin, giving him due credit for his observations.

In a letter to Cadwallader Evans, dated London, February 20, 1768, Franklin in a most suggestive way discusses the subject of lead poisoning in these words:

"In yours of November 20th, you mention the lead in the worms of stills as a probable cause of the dry belly-ache among punch-drinkers in our West Indies. I had before acquainted Dr. Baker with a fact of that kind, the general mischief done by the

use of leaden worms, when rum-distilling was first practised in New England, which occasioned a severe law there against them; and he has mentioned it in the second part of his piece not yet published. I have long been of opinion, that that distemper proceeds always from a metallic cause only; observing that it affects, among tradesmen, those that use lead, however different their trades,—as glaziers, letter-founders, plumbers, potters, whitelead makers, and painters; (from the latter, it has been conjectured, it took its name *colica Pictonum*, by the mistake of a letter, and not from its being the disease of Poictou;) and, although the worms of stills ought to be of pure tin, they are often made of pewter, which has a great mixture in it of lead."

On another occasion Franklin made the following observations regarding his experience when working as a printer in London:

"I there found a practice I had never seen before, of drying a case of types (which are wet in distribution) by placing it sloping before the fire. I found this had the additional advantage, when the types were not only dried but heated, of being comfortable to the hands working over them in cold weather. I therefore sometimes heated my case when the types did not want drying. But an old workman, observing it, advised me not to do so, telling me I might lose the use of my hands by it, as two of our companions had nearly done, one of whom that used to earn his guinea a week, could not then make more than ten shillings, and the other, who had the dangles, but seven and sixpence. This, with a kind of obscure pain, that I had sometimes felt, as it were in the bones of my hands when working over the types made very hot, induced me to omit the practice. . . . I have been told of a case in Europe, I forget the place, where a whole family was afflicted with what we call the dry belly-ache, or *colica Pictonum*, by drinking rain water. It was at a country-seat, which, being situated too high to have the advantage of a well, was supplied with water from a tank, which received the water from the leaded roofs. This had been drunk several years without mischief; but some young trees planted near the house growing up above the roof, and shedding their leaves upon it, it was supposed that an acid in those leaves had corroded the lead they covered, and furnished the water of that year with its baneful particles and qualities."

When Franklin and Sir John Pringle were in Paris together,

in 1767, the latter visited La Charité, a hospital noted for its successful treatment of lead poisoning, and brought away a pamphlet containing a list of the names of persons, with their professions or trades, who had been cured there. Franklin examined the list, and found that all the patients were of trades that, some way or other, use or work in lead.

INVESTIGATION OF MESMERISM.

In 1784, the king of France appointed Franklin a member of a Commission charged with the duty of investigating mesmerism or animal magnetism. This Commission consisted of four physicians—Borie, Sallin, D'Arcet, and Guillotin; and five members of the Royal Academy, Franklin, Le Roy, Bailly, Bebory, and Lavoisier.

Mesmer had been driven in disgrace from Germany and settled in Paris in 1778. He had at the time of the appointment of this Commission attained an immense fame and become the rage in the world of science and fashion of Paris. His income was enormous, and he lived in princely style. His influence had become so great that it is said the government at one time offered him a pension of 20,000 francs a year for his secret.

Mesmer himself was too clever to submit to the investigation of the Commission; but one of his pupils, Deslon, who was himself said to have cleared 2,000,000 francs, was led to submit to the inquiries of the Commission.

The Commission investigated the subject through a period of five months, holding many meetings and making many experiments. Naturally they set out to ascertain whether the mesmeric phenomenon were not due to the operation of the imagination. One class of patients was led to believe that certain operations had been performed when they had not been; and in another class of patients, the operation was performed and the fact concealed from the subjects. To illustrate, the following experiments were performed: "M. Deslon brought with him a boy of about twelve years of age; an apricot tree was fixed upon in the orchard of Dr. Franklin's garden, considerably distant from any other tree, and calculated for the preservation of the magnetic power which might be impressed upon it. M. Deslon was led thither alone to perform the operation, the boy in the meantime remaining in the house, and another person along with him. We could have wished that M. Deslon had not been present at the subsequent part of the experiment, but he declared that

he could not answer for its success, if he did not direct his cane and his contenance toward the tree, in order to augment the action of the magnetism. It was therefore resolved, that M. Deslon should be placed at the greatest possible distance, and that some of the commissioners should stand between him and the boy, in order to ascertain the impracticability of any signals being made by M. Deslon, or any intelligence being maintained between them. These precautions in an experiment, the essence of which must be authenticity, are indispensable, without giving the person with respect to whom they are employed a right to think himself offended. The boy was then brought into the orchard, his eyes covered with a bandage, presented successively to four trees upon which the operation had not been performed, and caused to embrace each of them for the space of two minutes, the mode of communication which had been prescribed by M. Deslon himself. M. Deslon, present, and at a considerable distance, directed his cane toward the tree which had been the object of his operations. At the first tree, the boy being interrogated at the end of a minute, declared that he perspired in large drops; he coughed, expectorated, and complained of a slight pain in his head. The distance of the tree which had been magnetized was about twenty-seven feet. At the second tree he felt the sensations of stupefaction and pain in his head; the distance was thirty-six feet. At the third tree the stupefaction and headache increased considerably; he said that he was approaching to the tree which had been magnetized; the distance was then about thirty-eight feet. In fine, at the fourth tree which had not been rendered the object of the operation, and at the distance of about twenty-four feet from the tree which had, the boy fell into a crisis; he fainted away, his limbs stiffened, and he was carried to a neighboring grass-plot, where M. Deslon hastened to his assistance and recovered him."

The second experiment is likewise quoted: "One day the Commission were all together at Passy, at the home of Dr. Franklin, and M. Deslon was with them, they having previously entreated the latter to bring some of his patients with him, selecting those of the lower class, who were more susceptible to the magnetism. M. Deslon brought two women; and while he was employed in performing the operation upon Dr. Franklin and several persons in another apartment, the two women were separated, and placed in different rooms. One of them, Dame

P———, had films over her eyes; but as she could always see a little, the bandage already described was employed. *She was persuaded that M. Deslon had been brought into the room to perform the magnetical operation;* silence was recommended; three commissioners were present, one to interrogate, another to take minutes of the transaction, and the third to personate M. Deslon; he was desired to begin the operation; the three commissioners in the meantime remained perfectly quiet and solely occupied in observing her symptoms. At the end of three minutes the patient began to feel a nervous shuddering; she had then successively a pain in the back of her head, in her arms, a creeping in her hands (that was her expression); she grew stiff, struck her hands violently together, rose from her seat, stamped with her feet. The crisis had all the regular symptoms. The other commissioners who were in the adjoining room with the door shut, heard the stamping of the feet and the clapping of the hands, and without seeing anything were witnesses to this noisy experiment. The two commissioners we have mentioned were with the other patient, Mademoiselle B———, who was subject to nervous distempers. No bandage was employed upon her, but her eyes were at liberty; she was seated with her face toward a door which was shut, and persuaded that M. Deslon was on the other side, employed in performing upon her the magnetical operation. This had scarcely taken place a minute before she began to feel the symptoms of shuddering; in another minute she had a chattering of the teeth and a universal heat; in fine, in the third minute she fell into a regular crisis. Her respiration was quick, she stretched out both her arms behind her back, twisting them extremely, and bending her body forward; her whole body trembled; the chattering of her teeth became so loud that it might be heard in the open air; she bit her hands and that with so much force that the marks of the teeth remained perfectly visible."

- The commissioners asked Deslon to reply to these inquiries:
- 1st. To give proof of the existence of animal magnetism.
 - 2d. To reveal to them his ideas about this discovery.
 - 3d. To prove to them its usefulness in healing the sick.

The Commission, after observing Deslon's method of procedure without being convinced, resolved to make experiments itself. They tried to magnetize each other several times without result. They took seven of Deslon's patients to Franklin's home

at Passy, where quiet a series of experiments was made, two of which have just been quoted. The report of the Commission was quite lengthy and is said to have been drawn up by Franklin; but its conclusions were brief and very much to the point. They follow:

"The commissioners having recognized that the animal magnetic fluid can not be perceived by any of our senses; that it had no influence either upon themselves, or upon the sick whom they subjected it to; feeling assured that the pressing and touching bring about in the animal economy changes which are rarely favorable, and in the imagination shocks which are always grievous; having in short, demonstrated by incisive experiments, that imagination without magnetism produces convulsions, and that magnetism without imagination produces nothing, their unanimous conclusion was that there is no proof of the existence of fluid animal magnetism; that this fluid, since it does not exist, is of no use; that the violent effects observed at the public treatment are due to the manipulation, to an aroused imagination, and to that quality of involuntary imitation, which leads us in spite of ourselves to repeat whatever strikes our senses. And at the same time they believe they are obliged to add as an important observation, that the manipulations and the repeated action of the imagination, in order to produce the crisis, can be injurious on account of this quality of imitation, of which nature seems to us to have made law; and that, consequently every public treatment in which magnetism is used can have in the long run only pernicious results."

Tourtourat, a pupil of Gilles de la Tourette, says that this report was pronounced, by his master, "a scientific work of the first order, worthy of being consulted even to-day by those interested in hypnotism and in diseases of the nervous system."

The effect of this report was to drive Mesmer from Paris eventually. Some of his followers, however, continued his methods in Paris for a time. But the immense prestige gained by the arch-charlatan was gone.

Writing to William Temple in a letter dated Passy, August 25, 1784, regarding the report of the Commission appointed to investigate mesmerism, Franklin says: "It makes a great deal of talk. Everybody agrees that it is well written; but many wonder at the force of imagination describ'd in it, as occasioning convulsions, &c., and some fear that consequences

may be drawn from it by infidels to weaken our faith in some of the miracles of the New Testament. I send you two copies. You would do well to give one to the French Ambassador, if he has not had it. Some think it will put an end to mesmerism. But there is a wonderful deal of credulity in the world, and deceptions as absurd, have supported themselves for ages."

In a letter dated Passy, September 8, 1784, Franklin wrote to William Temple Franklin in a postscript of a letter as follows:

"Mesmer has complained to the Parliament of our Report, and requested that they appoint Commissaries, to whom he might submit the Examination of—not his Theory and Practice, but—*un Plan qui renfermera les seuls moyens possibles de constater infailliblement l' existence & l' utilité de sa decouverte.* The Petition was printed. Many thought the Parliament would do nothing in it. But they have laid hold of it to clinch Mesmer, and oblige him to expose all directly. So that it must soon be seen whether there is any difference between his Art & Deslon's. Voici leur."

On April 29, 1785, he again speaks of Mesmer in a letter to Dr. Ingenhousz: "Mesmer continues here and has still some Adherents and some Practice. It is surprising how much Credulity still subsists in the World. I suppose all the Physicians in France put together have not made so much Money during the Time he has been here, as he has done. And we have now a fresh Folly. A Magnetiser pretends that he can establish what is called a *Rapport* between any Person and a Somnambule, by a simple strong Volition only, without Speaking or making any Signs; and many People daily flock to see this strange Operation!"

A FEW MISCELLANEOUS SCIENTIFIC OBSERVATIONS PERTAINING TO MEDICINE.

In one of his letters to Dr. Dubourg he speaks of the effect upon the flesh of animals which are killed by electricity, stating that he has been led to believe that the flesh of such animals putrefies very rapidly. The practical bent of Franklin's mind comes into operation, for he observes: "It is not unreasonable to presume, that, between the period of their death and that of their putrefaction, a time intervened in which the flesh might be only tender, and not sufficiently so to be served at table. Add to this, that persons, who have eaten of fowls killed by our feeble

imitation of lightning (electricity) and dressed immediately, have asserted, that the flesh was remarkably tender."

In a letter to the Duc de la Rochefoucauld, under date of Philadelphia, October 22, 1728, Franklin writes: "I thank you much for the Dissertation sur la Nyctalopie. It was quite a Novelty to me, having never before heard of such a Malady. One of our most ancient Physicians assures me; that tho' he had some knowledge of the Distemper from his Reading, he never knew an Instance of it in any Part of North America. Indeed we have no Chalk in this country, nor any Soil so white as to dazzle the Eyes when the Sun's Light is reflected from it. The Dissertation mentions that there are *terres cretacees*, &c. Are those *terres* white?

"While I resided in England, I read in a Newspaper, that in a Country Village at the Funeral of a Woman whose Husband had died of the Small-pox 30 years before, and whose Grave was dug so as to place her by his Side, the Neighbors at ending the Funeral were offended with the smell arising out of the Grave, occasioned by a Breach in the Husband's old Coffin, and 25 of them were in a few days after taken ill with that Distemper, which was not in that Village or its Neighborhood, nor had been for the number of (years above mentioned).

"About the Year 1763 or 1764, several Physicians of London, who had been present from Curiosity at the Dissection of an Egyptian Mummy, were soon after taken ill of a malignant fever, of which they died. Opinions were divided on this occasion. It was thought by some that the Fever was caused by Infection from the Mummy; in which Case the Disease it died of must have been embalmed as well as the Body. Others who considered the Length of Time; at least 2,000 Years, since that Body died, and also that the Embalming must be rather supposed to destroy the Power of Infection, imagined the Illness of these Gentlemen must have had another Original.

"About the year 1773, the Captain of a Ship, which had been at the island of Tenneriffe, brought from thence the dried Body of one of the ancient inhabitants of that Island, which must have been at least 300 years old, that custom of drying the Dead there having been so long discontinued. Two members of the Royal Society went to see that body. They were half an hour in a close room with it, examining it very particularly. The next day they were both infected with a singularly violent *cold*, attended with

uncommon circumstances, which continued a long time. On comparing together the Particulars of their Disorder, they agreed in suspecting that possibly some effluvia from the Body might have been the occasion of that Disorder in them both; perhaps they were mistaken. But as we do not yet know with Certainty how long the Power of Infection may in some Bodies be retained, it seems well in such Cases to be cautious till farther Light shall be obtained."

In his private diary kept in France under date, July 3, 1781, Franklin makes this interesting note: "July 3d.—Mr. Smeathman comes and brings two English or Scotch Gentlemen; one a Chevalier of some Order, the other a Physician who had lived long in Russia. Much Conversation. Putrid Fevers common in Russia, and in Winter much more than in Summer; therefore supposed to be owing to their hot Rooms. In a gentleman's House there are sometimes one hundred domestics; these have not beds, but sleep twenty or thirty in a close room warmed by a stove, lying on the floor and on benches. The stoves are heated by wood. As soon as it is burnt to coals, the chimney is stopped to prevent the escape of hot and entry of cold air. So they breathe the same air over and over again all night. These Fevers he cured by wrapping the patient in linen wet with vinegar, and making them breathe the vapor of vinegar thrown on hot bricks. The Russians have the art of distilling spirits from milk. To prepare it for distillation it must when beginning to sour, be kept in continual agitation for twelve hours; it then becomes a uniform vinous liquor, the cream, curd, and aqueous part or whey, all intimately mixed. Excellent in this state for restoring emaciated bodies. This operation on milk was discovered long since by the Tartars, who in their rambling life carry milk in leather bags on their horses, and the motion produced the effect. It may be tried with us by attaching a large bag of milk to some part of one of our mills."

In 1762 Franklin returned to America and took his place in the Colonial Assembly.

He published some experiments which he made in Philadelphia, in 1749, on the effect of electricity on living bodies. He states that it is known that electricity makes people blind. He tells of a pigeon which had fallen over as a result of an electric shock and which recovered, but afterwards it would eat nothing and was so enfeebled that it soon died. He speaks of a strong

chicken as the largest animal which he had killed by an electric shock.

POPULAR MEDICINE.

It is generally acknowledged that it is a difficult matter for anyone, physician or layman, to write an essay on hygienic or medical topics suitable for the needs of the laity. I have therefore thought it well to insert at this place two pieces by Franklin which may be regarded as examples of popular medical writing, and which I think all will agree are well done.

The following letter, written by Franklin to the daughter of his old friend, "The good Bishop of St. Asaph," is a good illustration of Franklin's imitable style; and it contains the soundest sort of advice on hygienic matters put in such an attractive form that it might well serve as a model for those, whether physicians or laymen, who essay to write on health matters for the laity.

"The Art of Procuring Pleasant Dreams."

"Inscribed to Miss (Shipley), Being Written at Her Request.

"As a great part of our life is spent in sleep, during which we have sometimes pleasant and sometimes painful dreams, it becomes of some consequence to obtain the one kind and avoid the other; for whether real or imaginary, pain is pain and pleasure is pleasure. If we can sleep without dreaming, it is well that painful dreams are avoided. If while we sleep we can have any pleasant dream, it is as the French say, *autant de gagne*, so much added to the pleasure of life.

"To this end it is, in the first place, necessary to be careful in preserving health, by due exercise, and great temperance; for, in sickness, the imagination is disturbed, and disagreeable, sometimes terrible, ideas are apt to present themselves. Exercise should precede meals, not immediately follow them; the first promotes, the latter, unless moderate, obstructs digestion. If, after exercise, we feed sparingly, the digestion will be easy and good, the body lightsome, the temper cheerful, and all the animal functions agreeably performed. Sleep, when it follows, will be natural and undisturbed; while indolence, with full feeding, occasions nightmares and horrors inexpressible; we fall from precipices, are assaulted by wild beasts, murderers, and demons, and experience every variety of distress. Observe, however, that the quantities of food and exercise are relative things; those who move much may, and indeed ought, to eat more; those who use little exercise should eat little. In general, mankind, since the improvement of cookery, eats about twice as much as nature requires. Suppers are not bad, if we have not dined; but restless nights naturally follow hearty suppers after full dinners. Indeed, as there is a difference in constitutions, some rest well after these meals; it costs them only a frightful dream and an apoplexy, after which they sleep till doomsday. Nothing is more common in the newspapers than instances of people who, after eating a hearty supper, are found dead abed in the morning.

"Another means of preserving health, to be attended to, is the having a constant supply of fresh air in your bed-chamber. It has been a great mistake, the sleeping in rooms exactly closed and in beds surrounded by curtains. No outward air that may come in to you is so unwholesome as the unchanged air, often breathed, of a close chamber. As boiling water does not grow hotter by longer boiling if the particles that receive greater heat can escape, so living bodies do not putrefy if the particles, so fast as they become putrid, can be thrown off. Nature expels them by the pores of the skin and the lungs, and in a free open air they are carried off; but in a close room we receive them again and again, though they become more and more corrupt. A number of persons crowded into a small room thus spoil the air in a few minutes, and even render it mortal, as in the Black Hole at Calcutta. A single person is said to spoil only a gallon of air per minute, and therefore requires a longer time to spoil a chamber full; but it is done, however, in proportion and many putrid disorders hence have their origin. It is recorded of Methusalem who, being the longest liver, may be supposed to have best preserved his health, that he slept always in the open air; for, when he had lived five hundred years, an angel said to him: 'Arise, Methusalem, and build thee an house, for thou shalt live yet five hundred years longer.' But Methusalem answered and said, 'If I am to live but five hundred years longer it is not worth while to build me an house; I will sleep in the air, as I have been used to do.' Physicians, after having for ages contended that the sick should not be indulged with fresh air, have at length discovered that it may do them good. It is therefore to be hoped that they may in time discover, likewise, that it is not hurtful to those who are in health, and that we may be then cured of the ærophobia that at present distresses weak minds and makes them choose to be stifled and poisoned rather than leave open the window of a bed-chamber or put down the glass of a coach.

"Confined air, when saturated with perspirable matter, will not receive more, and that matter must remain in our bodies and occasion diseases; but it gives some previous notice of its being about to be hurtful by producing certain uneasiness, slight indeed at first, which as with regard to the lungs is a trifling sensation and to the pores of the skin a kind of restlessness which is difficult to describe, and few that feel it know the cause of it. But we may recollect that sometimes on waking in the night we have, if warmly covered, found it difficult to get asleep again. We turn often without finding repose in any position. This fidgettiness (to use a vulgar expression for want of a better) is occasioned wholly by an uneasiness in the skin, owing to the perspirable matter—the bed-clothes having received their quantity and, being saturated, refusing to take any more. To become sensible of this by an experiment, let a person keep his position in the bed but throw off the bed clothes and suffer fresh air to approach the part uncovered of his body; he will then feel that part suddenly refreshed, for the air will immediately relieve the skin by receiving, licking up and carrying off the load of perspirable matter that incommoded it. For every portion of cool air that approaches the warm skin, in receiving therewith a degree of heat that rarefies and renders it lighter, when it will be

pushed away with its burthen by cooler and therefore heavier fresh air which for a moment supplies its place and then, being likewise changed and warmed, gives way to a succeeding quantity. This is the order of nature, to prevent animals being infected by their own perspiration. He will now be sensible of the difference between the part exposed to the air and that which, remaining sunk in the bed, denies the air access: for this part now manifests its uneasiness more distinctly by the comparison, and the seat of the uneasiness is more plainly perceived than when the whole surface of the body was affected by it.

"Here, then, is one great and general cause of unpleasing dreams. For when the body is uneasy the mind will be disturbed by it and disagreeable ideas of various kinds will in sleep be the natural consequences. The remedies, preventive and curative, follow:

"1. By eating moderately (as before advised for health's sake) less perspirable matter is produced in a given time, hence the bed-clothes receive it long before they are saturated, and we may therefore sleep longer before we are made uneasy by their refusing to receive any more.

"2. By using thinner and more porous bed-clothes, which will suffer the perspirable matter more easily to pass through them, we are less incommoded, such being longer tolerable.

"3. When you are awakened by this uneasiness and find you can not easily sleep again, get out of bed, beat up and turn your pillow, shake the bed-clothes well, with at least twenty shakes, then throw the bed open and leave it to cool; in the meantime, continuing unrest, walk about your chamber till your skin had time to discharge its load, which it will do sooner as the air may be dried and cooler. When you begin to feel the cold air unpleasant then return to your bed and you will soon fall asleep, and your sleep will be sweet and pleasant. All the scenes presented to your fancy will be, too, of the pleasing kind. I am often as agreeably entertained with them as by the scenery of an opera. If you happen to be too indolent to get out of bed you may, instead of it, lift up your bed-clothes with one arm and leg, so as to draw in a good deal of fresh air, and by letting them fall force it out again. This, repeated twenty times, will so clear them of the perspirable matter they have imbibed as to permit your sleeping well for sometime afterward. But this latter method is not equal to the former.

"Those who do not love trouble and can afford to have two beds will find great luxury in rising, when they wake in a hot bed, and going into a cool one. Such shifting of beds would also be of great service to persons ill of a fever, as it refreshes and frequently produces sleep. A very large bed, that will admit a removal so distant from the first situation as to be cool and sweet, may in a degree answer the same end.

"One or two observations more will conclude this little piece. Care must be taken, when you lie down, to dispose your pillow so as to suit your manner of placing your head and to be perfectly easy; then place your limbs so as not to bear inconveniently hard upon one another, as, for instance, the joints of your ankles; for, though a bad position may at first give but little pain and be hardly noticed, yet a continuance will

render it less tolerable and the uneasiness may come on while you are asleep and disturb your imagination.

"These are the rules of the art. But though they will generally prove effectual in producing the end intended there is a case in which the most punctual observance of them will be totally fruitless. I need not mention the case to you, my dear friend, but my account of the art would be imperfect without it. The case is, when the person who desires to have pleasant dreams has not taken care to preserve, what is necessary above all things.

"A GOOD CONSCIENCE."

The second piece is likewise written in Franklin's happiest style, with a delicious vein of humor permeating it.

"A Petition of the Left Hand,"

"To Those Who Have the Superintendency of Education.

"I address myself to all friends of youth and conjure them to direct their compassionate regards to my unhappy fate, in order to remove the prejudice of which I am the victim. There are twin sisters of us, and the two eyes of man do not more resemble nor are capable of being upon better terms with each other, than my sister and myself, were it not for the partiality of our parents, who make the most injurious distinctions between us. From my infancy I have been led to consider my sister as a being of a more elevated rank. I was suffered to grow up without the least instruction, while nothing was spared in her education. She had masters to teach her writing, drawing, music, and other accomplishments, but if by chance I touched a pencil, a pen, or a needle, I was bitterly rebuked, and more than once I have been beaten for being awkward and wanting a graceful manner. It is true my sister associated me with her upon some occasions, but she always made a point of taking the lead, calling upon me only from necessity or to figure by her side.

"But conceive not, sirs, that my complaints are instigated merely by vanity. No; my uneasiness is occasioned by an object much more serious. It is the practice in our family that the whole business of providing for its subsistence falls upon my sister and myself. If any indisposition should attack my sister—and I mention it in confidence upon this occasion that she is subject to the gout, the rheumatism and cramp, without making mention of other accidents—what would be the fate of our poor family? Must not the regret of our parents be excessive at having placed so great a difference between sisters who are so perfectly equal? Alas! we must perish from distress; for it would not be in my power even to scrawl a suppliant petition for relief, having been obliged to employ the hand of another in transcribing the request which I have now the honor to prefer to you.

"Condescend, sirs, to make my parents sensible of the injustice of an exclusive tenderness and of the necessity of distributing their care and affection among all their children equally. I am, with a profound respect, sirs, your obedient servant,

"THE LEFT HAND."

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The splendid work of Prof. A. H. Smyth, which has just been published, contains many letters of Franklin which are there printed for the first time; and it is to this work I am especially indebted for much material.

I am under obligations to the executors of Prof. Smyth's estate, C. M. Farr, Jr., Esq., and to the publishers, the Macmillan Company, for their kind permission to quote several of Franklin's letters from this work, which appear there for the first time.

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